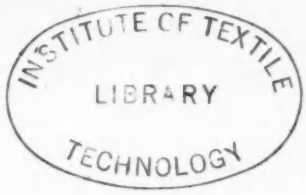
INSTITUTE OF TEXTILE TECHNOLOGY
CHARLOTTESVILLE, VIRGINIA



AMERICAN DYESTUFF REPORTER

VOLUME 48

1959

NORMAN A. JOHNSON
Editor

CHARLES A. WHITEHEAD
Managing Editor

MYRON D. REESER
Business Manager

HERBERT A. STAUDERMAN
Advertising Manager

WILLIAM J. O'CONNOR
Production Manager

BERYL A. LAKNER
Circulation Manager

OFFICIAL PUBLICATION OF THE PROCEEDINGS, AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

American Dyestuff Reporter was founded in 1917 and the Textile Colorist and Converter (formerly Textile Colorist) was incorporated with it in January, 1949. Published every other Monday, by the **HOWES PUBLISHING COMPANY, INC.**, 44 East 23rd Street, New York 10, N. Y. **C. R. Howes**, President; **Ernest J. Finan**, Executive Vice-President; **Norman A. Johnson**, Vice-President & Treasurer; **Myron D. Reeser**, Vice-President; **Clara Patrick**, Secretary.

Telephone SPring 7-9364

AMERICAN
DYESTUFF REPORTER
DEVOTED TO TEXTILE WET-PROCESSING

contents

VOLUME 48 JANUARY 12, 1959 NUMBER 1

special article

Colloidal Factors in Textile Pigment Printing Emulsions 1
Elliott Nelson

aatcc proceedings

feature articles

Damage Caused by Retained Chlorine P5
Committee on Damage Caused by Retained Chlorine
Detection of Antibacterial Property of Fabrics. Agar Plate Method .. P8
Committee on Antibacterial Agents
AATCC Research at Work :—
AATCC's Contribution to Industry through Research P10
Charles W Dorn
Analysis of Consumer Complaints P11
P J Fynn
Research Developments—Committee on Colorfastness to Light P12
Joseph E Norton
Research Developments—Committee on Damage Caused by Retained Chlorine P14
Richard F Aurich
Research Developments—Committee on Drycleaning Test Methods . P17
Albert E Johnson
Research Developments—Committee on Colorfastness to Washing .. P18
Ralph B Smith
Research Developments—Committee on Wash and Wear P20
Graham M Richardson
Research Developments—Committee on Dimensional Changes in Textile Fibers P21
Edward Artim
The Importance of AATCC to the Textile Industry and the Consumer P23
George H Johnson

miscellaneous

Future Papers to Appear in the Proceedings P7
AATCC Calendar P22
A Message from the New President P25
Plans Underway for '59 Convention P25
Membership Applications P26
Elected to Membership P27
Activities of the Local Sections P28
AATCC Committee on Evaluation of Desizing Agents Reorganized .. P29

departments

Patent Digest 31
Paul Wengraf
Index to Patent Digest for 1958 32
News of the Trade 33

Copyright, 1959, Howes Publishing Co, Inc

Contents of previous issues can be found by consulting the Industrial Arts Index and the Engineering Index, Inc, at your library

SHORTER DYEING CYCLES: FINER FABRICS!

National
LANAMID
Premetalized Dyes!

When you want to protect the hand . . . preserve surface effects . . . or up-grade the quality of your fabrics—it's wise to choose your dyes from the new, neutral dyeing LANAMID range.

They give you maximum all-around fastness on wool, silk, nylon and modified acrylics . . . *without extended processing!* Inherent fiber characteristics are retained and substantial dyeing time is saved.

LANAMID Dyes exhaust smoothly to produce extremely level results even on tightly woven piece goods. Since they are non-selective, LANAMIDS give uniform coverage of varying grades of wool, free of skitteriness.

There are 16 dyes presently in the range . . . and more on the way. With surface effects and textures getting renewed attention, you will want to be fully informed on the LANAMIDS. Your National Aniline representative will gladly furnish shade card and samples.

Allied Chemical

NATIONAL ANILINE DIVISION

40 Rector Street, New York 6, N. Y.

Atlanta Boston Charlotte Chattanooga Chicago Greensboro
Los Angeles Philadelphia Portland, Ore. Providence San Francisco

AMERICAN

DYESTUFF REPORTER

Volume 48 January 12, 1959 Number 1

COLLOIDAL FACTORS IN TEXTILE PIGMENT PRINTING EMULSIONS

ELLIOT NELSON

Research Chemist
Textile Color Department
Ansbacher-Siegle Corp
Harrison, NJ

It is advantageous for those who use pigment printing emulsions to understand the complexities of these colors from the formulation point of view.

The purpose of this paper is to survey only the most important formulation factors common to these emulsions. The primary requirements to be met by manufacturers are listed.

The fundamental components of emulsion pigment printing systems,

A—pigment

B—emulsifying or dispersing agent

C—vehicles or binders

D—thinners or solvents

are discussed in turn, as are the colloidal theories of emulsions which are included to afford perspective and to broaden understanding of the subject.

Research into these factors is continuing.

INTRODUCTION

TEXTILE pigment printing emulsions, as a class of industrial products in a highly competitive and rapidly growing field, have been one of the specialized types of emulsions least discussed in literature. This inactivity has been inconsistent with their present popularity, and where applications continually are being made despite the "trade secret" status of these emulsions.

The aim of this paper is not to divulge these "secrets", but to survey the colloidal factors to be considered in the formulation of these emulsions.

DISCUSSION

Pigment printing emulsions, because of stringent customer fastness demands, must meet the following requirements.

1) The pigments used must have good lightfastness.
2) The pigments used must have good washfastness.
3) The pigments should be resistant to gas fading.
4) The pigment emulsions should facilitate printing on all types of natural and synthetic fabrics.
5) The pigmented printing emulsions must facilitate sharp marking and have good reproduction fidelity.
6) The pigment emulsions must develop good brilliance.
7) The final print must have good chlorine fastness.
8) The final print must have good drycleaning and solvent fastness.
9) The final print must have good abrasion (crocking) resistance.

Pigment printing emulsions offer the following impressive advantages:

1) Printing with emulsions is direct, thereby permitting rapid corrections of defects.
2) Usually no aftertreatment other than a quick cure is necessary.
3) Pigmented printing emulsions can be combined with each other in all proportions to facilitate shading.
4) Pigment emulsions can be run in combination with soluble or developed colors, such as aniline black, azoic couplings, and vat dyes, making it possible to achieve a wide range of color combinations not otherwise obtainable.
5) The breaking or cracking of lightweight fabrics is minimized by pigment printing.
6) Often the economy is greater than that of dyes, due to lower processing, chemical cost, and greater selectivity of shades.
7) Pigment emulsions will not increase the stiffness (hand) of fabrics.
8) Easy clean-up of equipment is realized.
9) The solvents used in pigment emulsions are of the "safety" type.

In order to appreciate the colloidal complexity in formulation, we must look at some of the main classifications that may comprise these pigment printing emulsions:

A) Colors
B) Vehicles
C) Thinners
D) Protective colloids and suspending agents
E) Emulsifying agents
F) Other additives.

These classifications are general. A brief search of the literature will show that the classifications listed can be broken down continuously into smaller and more specific categories. The result is a choice of an almost unlimited number of chemical components of varying structures, each with its own physical property influences, for the chemist to utilize. It is thus quite logical that a number of different "systems", based on these variations, have been developed by competing companies using a common knowledge of formulation fundamentals.

As it is practically impossible to enumerate all the component variations, I have chosen to take the most essential components and treat them from their most important colloidal aspects. It is doubtful whether all the colloidal variables can ever be defined in these complex pigmented emulsion systems.

The fundamental components any pigment printing system must contain, whether the system is oil-in-water (O/W), water-in-oil (W/O), or single phase, are the following:

A) Pigment
B) Emulsifying or dispersing agent
C) Vehicle or binder
D) Thinner or solvent.

A) THE PIGMENT——Taking the pigment as the starting and pri-

mary point of interest, the specific pigments used in textile pigment printing emulsions fall into the general classifications described by Jones (*1*):—

1) Inorganics
   a) Salts - lead chromates, cadmium sulfides, etc.
   b) Oxides - iron, chromium, titanium oxides, etc.
2) Azoics
   naphthol-amine couplings, etc.
3) Coordinated metal complexes
   phthalocyanines, pigment green B, etc.
4) Vat pigments
   thioindigoid maroons, etc.

Within the above pigment classes, specific properties often vary quite appreciably from pigment to pigment.

The inorganics usually are characterized by insolubility in organic solvents, good lightfastness and heat resistance, but poor tinctorial power.

The azoic pigments usually are characterized by high tinctorial power, excellent alkali resistance, and brightness, although they vary widely in lightfastness and solvent resistance.

The coordinated metal complexes are today the most important group because they are characterized by outstanding fastness to light, solvent resistance, alkali fastness, and exceptional tinctorial strength and brightness.

The vat pigments are usually excellent with respect to lightfastness, although they are highly variable with respect to solvent resistance. Many exist with both lightfastness and solvent resistance; however, their high cost is often a deterrent to their use.

Mention here should be made of the various extender pigments (subject to the same colloidal effects) such as clays, attapulgus earth, diatomaceous silica, etc, which, although they have no tinting or specific hiding qualities, often influence color value and consistency of the emulsion *(2)*.

The primary problem in formulating textile pigment printing emulsions, whether they start as dry powders, or presscake, is to wet and disperse them in the vehicle. Factors which effect this dispersion are many and highly variable. Among these are:

1) Purity of intermediates used in making the pigment
2) Pigment precipitation conditions
3) Particle size distribution
4) Crystal structure and stability
5) Degree of dispersion.

The purity, method of precipitation, pH, washing, and drying of pigments are factors known to be very important in pigment dispersability, brightness and fastness properties. The forming of a crystal lattice structure during crystallization may be an important factor in later emulsion stability due to its effect on the emulsifier's double layer orientation. Since pigment crystallization lies in the hands of the pigment manufacturer, the emulsion formulator usually starts after this critical stage is complete.

The pigment manufacturer tries to process pigment particle size so that it gives the maximum efficiency relative to normal light sources for the development of opacity and tinctorial characteristics. It is to be noticed that, for a colored pigment, if tinting strength is plotted against particle diameter for a range of very small particle sizes, the tinting strength is constant. As the size increases, the tinting strength decreases until the rate of decrease with increasing size becomes small. If light scattering opacity is plotted vs the size of the same colored pigment, it will be noted that opacity is maximum at a particle size which is larger than that at which the tinting strength begins to decrease. Consequently as the particle size of the colored pigment becomes smaller than the optimum size for maximum opacity, the strength increases, but so does the darkness of the masstone. There is no size at which we can have both the highest strength and maximum lightness of masstone (*3*). The particle size distribution also has a strong influence on ultimate film continuity, solvent demand for vehicle, viscosity of the emulsion, and strength and reproducability of batches. Colored pigments are thus more critical than whites, which depend upon complete reflection of all visible light, or blacks, which depend upon absorption of all visible light. Whites and blacks may tolerate reasonable variation in particle size without developing more than slight variations in tone and strength.

Since many crystal pigments exhibit polymorphism, crystal structure and shape have profound hue effects. This is shown by alpha phthalocyanine blue, which is unstable, crystallizing, and strong tinctorially, and by a beta type which is noncrystallizing, stable, and weaker tinctorially. In addition, lead chromate exists in three different crystal structures: monoclinic, a medium yellow; rhombic, a relatively unstable light yellow; and tetragonal, a strong brilliant orange. The last is stable in the presence of lead molybdate and is in combination the actual molybdate orange in use.

Dispersion is probably the most important factor in textile pigment printing color formulation. Generally it is considered that pigments are either hydrophilic or hydrophobic, and these properties have importance in wettability and dispersion ease of these pigments. Pigment particles can be pictured as irregularly shaped solids, surrounded by a bound envelope of air, gas, or liquid. The initial obstacle to overcome is to convert the pigments to a dispersion in the desired liquid so they are finely and uniformly separated by vehicle.

This may be done by a wide variety of mixing or/and grinding operations. The pigmented composition obtained as a result of this work can be as follows:

1) *Aggregation*, which compromises poor dispersion wherein the work done has failed to separate the pigment particles. Thus, much of the original air is retained, and the particles remain tightly packed into hard aggregates.
2) *Dispersion*, wherein pigment particles are completely separated from each other by vehicle, which wets their surface and displaces the air or moisture previously bound.
3) *Flocculation*, in which the intermediate form of wetted, deaggregated pigment particles act under the effect of Van der Waals forces as large, individual, pigment masses, unless the attracting forces are reversed by mechanical (mixing) forces, or chemical action.

Aggregate formation is not considered by Hoback (*4*) to be caused by Van der Waals forces which developed flocculation, but rather to be the result of mechanical work or pressure brought to bear upon the dry pigment aggregate before the vehicle can penetrate, separate, and wet the particles. He also classifies pigments as to behavior in the dispersion process as follows:

1) *Non-adherent surface*, which eliminates air easily and produces a free dispersion with particles sizes conforming to manufacturer's specifications, such as ultramarine blue, chrome yellow, silica, etc.
2) *Adherent surface (fracturable)*, which induce coalescence or clustering of particles to form masses containing air (aggregates) which are surrounded by vehicle, such as titanium dioxide, molybdated chrome oranges, phthalo blues, etc. These can be reduced by regulating grinding procedures so as not to fracture the crystal.

3) *Adherent surface (plastic),* which induces clusters that exhibit a plastic nature as they tend to deform when grinding is attempted and are most troublesome to disperse, such as carbon blacks.

Studies show that classes 2 and 3 have special ability to physically absorb small molecular or colloidal units, and thus this tends to explain some of the tendencies toward livering and consistency variations met with in systems with vehicles in critical equilibrium states. It is thus apparent that the nature of the pigment surface will influence rates of dispersion and aggregation.

Flocculation is described by many workers, including Kruyt and Van Klooster (5), as caused by the union of particles through the interattraction of matter due to the affect of surface tension and lowering of charge on particles to a critical potential, and is theoretically a function of the ratio of the probability of collisions to the probability of adhesions. The electric charge on the particles is a stability factor and is shown to act as an obstacle to the probability of adhesions. It is postulated that only those particles moving fast enough, depending upon concentration and temperature, will penetrate the protective electrically charged atmosphere of each particle. Green and Haslam (6) point out that the greater the pigment surface per unit shearing surface, the greater will be the flocculative force, rigidity, and yield value of the ensuing structure. Forbes (7) points out that pigment incompletely wet will aggregate due to the surface attraction. At any rate, flocculation is important as it generally produces characteristic shade changes in various classes of color (Table I). These flocculation characteristics are due to decreased reflection of incident light.

Since package stability is of prime importance in pigment printing colors, rheology is necessarily important. Shur (8) gives a table of the characteristics of flocculated vs dispersed systems (Table II).

Many of these flocculation problems are influenced by the use of wetting, dispersing, and emulsifying surfactants, which induce deflocculation by many mechanisms, especially adsorption, and thus eliminate structure by reducing the yield value to a negligible point.

B) EMULSIFYING AND DISPERSING AGENTS——Adsorption of surface-active agents is possible in a number of ways, and this adsorption has considerable effect on the final emulsion rheology, application ease, fastness of the film on the cloth, color value, and brightness of the print. Among adsorption phenomena are:

TABLE I

	Flocculation	*Dispersion*
Blue	red & weaker	green, brighter, cleaner
Green	olive & weaker	yellow, brighter, cleaner
Yellow	red & weaker	green, lighter, cleaner
Red	bluer & weaker	yellower & stronger

TABLE II

	Flocculated	*Dispersed*
Visual appearance	paste	fluid
Transparency	decreased	increased
Rheology	high yield value	low yield value
Sedimentation	fast, high volume	slow, small volume
Heat of immersion	low	high
Work of adhesion	low	high

1) *Amphipathic adsorption,* which increases the compatibility between the solid and liquid phases, decreases the interfacial tension (thus making it easier to subdivide the solid), and enables the surface of the solid to become more solvated.
2) *Reversed orientation adsorption,* which decreases solid and liquid dissimilarity and usually decreases interfacial tension. This also leads to a decrease in hydration (in aqueous media) of the surface of the solid and to flocculation in aqueous media and to dispersion in solvent media. It also may lead to phase transfer. The mechanism in contrast to amphipathic adsorption is a specific interaction between groups on the surface of the solid and polar groups of the surfactant. In a majority of cases the formation of salt linkages can be postulated.
3) *Selective adsorption,* which may take place amphipathically or with reversed orientation, is distinguished in that the degree of adsorption is greater at certain types of interfaces than at others. The degree varies considerably with system conditions, such as the phase into which the surfactant is introduced and also the phase in which the pigment is to be located.
4) *Pseudo adsorption,* which facilitates the formation of fresh phases by the adherence of thin interfacial layers which may be in metastable condition. Such film layers may not be treated thermodynamically. The condition established by adsorption of solid powders in emulsion stabilization is an example.

C) THE VEHICLE OR BINDER——The vehicle will be considered as "liquid", although it may range from a pure compound which exhibits a fixed boiling point, vapor pressure, etc to complex colloidal mixtures or gels, with all the mixtures and classes in between. Knowledge of the liquid will often determine choice of compounding equipment for dispersion efficiency. Vehicle appraisal is made on the basis of three fundamental characteristics: tack, molecular size, and polarity.

1) A high tack vehicle is considered to have a complex viscous structure which exhibits strong cohesive properties. It is evident that greater molecular complexity and molecular weight cause higher tack and facilitate the work transmission necessary for pigment dispersion without the vehicle itself being disrupted. Practical experience in equipment such as roller mills and heavy duty mixers, which depend on transmission of high shearing forces, has proven the value of high tack structural vehicles.
2) Gartner (9) has listed the cross-section dimensions of various complex molecules having hydrocarbon chains under 100 sq Angstrom units, such as fatty acids and linear esters (25-28 sq Angstrom units), linseed oil (60 sq Angstrom units approximately) and other triglycerides which may be four times the cross-sectional area of a fatty acid. Alkyd resins may range from eight to 30 times the fatty acid cross-sectional area, as stated by Long and Lawton (10). It is interesting to note, in the case of 200-Angstrom-unit diameter, how poorly heavy-bodied oils and resins penetrate in comparison to solvents, which promote better wetting but work contrary to vehicle tack.
3) A liquid capable of efficient work transmission must have efficient adhesion to the moving parts of the equipment and to the surface of the pigment masses to be separated. This property may often be acquired through incorporation of polar groupings in the vehicle. Kruyt and Van Klooster (5) describe polar compounds as containing ionogen groups such as —OH, —COOH, —NH_2, —SH, etc and that these polar groups possess electric-stray fields whose free energy is at a minimum when they occur in a space containing other polar molecules which mutually compensate.

Vehicle polarity is an important factor in developing the forces of adhesion necessary for efficient mechanical dispersion because strong forces are set up between its local dipoles and the pigment dipoles (*11*). Polarity in the vehicle also increases tack.

It is evident from the above that, in order to get maximum pigment dispersion, the proper equipment must be chosen, and the vehicle must be balanced properly, whether the process demands pigment dispersion in oil or water phase. The viscosity of these phases will vary with the complexity, degree of polymerization, and structure of the vehicle and will be in addition dependent upon the ratio of pigment to vehicle.

D) THE THINNER OR SOLVENT ——The importance of the solvent thinner or volatile portion of the vehicle is often overlooked in its affect on system properties. It has been mentioned previously for its affect on wetting of the pigment and its influence in decreasing vehicle tack by reducing vehicle structure. Examining a bit further, it may be seen whether the thinner is acting as a true solvent or as a diluent. Carothers (*15*), in discussing solubility and colloidal properties of high polymers, points out that like usually dissolves like, and that solubility decreases with increasing molecular weight. Since large molecules swell rather than dissolve, thus producing high viscosity effects, molecular solution can be associated with low viscosity. It would thus appear that the action of nonpolar aliphatic solvents are more in the nature of a diluent for polar nonvolatile compounds such as amine resins, whereas a polar solvent such as butanol is a true solvent. Knowing the relation of solvent to solute enables one to judge whether viscosity effects are due to true solution or merely to a dilution of undissolved solute. This is important with respect to pigment dispersion because vehicles based on dilution will be lacking in general cohesiveness. On the other hand vehicles that involve true solution offer the possible advantages of deaggregated solid micelles and softening of the polymer surface. This in turn increases cohesiveness and tack, thus facilitating pigment dispersion and cured film uniformity.

The thinner or solvent used has been shown on the basis of sedimentation to have pronounced affect on pigment flocculation. It was established that, for phthalocyanine blue dispersions, aromatic solvents were superior to aliphatic solvents in furnishing resistance to flocculation, and that ester solvents were superior to both. These differences were probably due to polarity balance in the case of esters, and properties of wetting in the case of aromatics, both effects being absent in the case of aliphatics. It was shown in addition that polar solvents mixed with aromatic solvent slowed down the flocculation and sedimentation. It has also been found by Bott (*12*) that resistance to flocculation will vary when aliphatic, semi-aromatic, or terpene solvents are used in combination with a medium oil alkyd vehicle.

Thinner has been shown, on the basis of dilution ratio, to be an important factor in the leveling, flow out, and flocculative tendencies in colloidally crowded emulsion latex paints, and would similarly exhibit these properties in pigment printing emulsions.

It is usually expected that the solvents used in textile printing are of the "safe" classification relative to flash point.

The emulsions used for resin-bonded pigment printing colors are the water-in-oil and oil-in-water types. Both systems comprise:

1) Pigment concentrate either O/W or W/O, and
2) Unpigmented extender emulsions of either type with viscosity adjusted for printing ease.

As a rule, the pigment concentrates contribute most to the cost of printing insofar as raw material costs go. These concentrates are cut in various ratios with their own emulsion-type extender to adjust color, shade, strength, and to achieve color blends.

It is evident that the previous discussion related mainly to the color concentrate although the final print film vehicle can be adjusted by varying either the concentrate oil or water phases or the extender oil or water phases.

One of the most important properties of these pigment concentrate emulsions is stability. To understand stability we look to the many colloidal factors in emulsions which have been studied by numerous investigators (*13*). As there is no single unified theory for emulsion formation and stability that satisfactorily explains all phenomena, a synopsis of the salient colloidal features in these theories will be advantageous.

The Viscosity Theory. This assumes that an emulsion is formed if two immiscible liquids are brought into intimate contact by stirring, grinding, etc and that the finished product is high in viscosity. The viscosity effect observed merely coincided with the formation of the emulsion as prepared, as while it is a factor in stability, it in itself doesn't guarantee stability in emulsions.

The Surface Film Theory. This assumes the existence of a film-like structure that surrounds and protects the globules of the internal phase and describes the formation of an interfacial layer of soap. This theory fails to explain how the interfacial film is produced, what keeps it in position, what gives it permanence, why the film gives way when the emulsion breaks, and what causes phase reversal.

The Interfacial Tension Theory. This assumes the reduction of the interfacial tension to explain emulsion formation. It has been shown that liquids having high interfacial tension values cannot be emulsified, and that those of suitable lowered values can be. This theory fails to explain phenomena such as phase reversal, multiple emulsion formation, and the action of antagonistic ions on interfacial tension. The theory also fails to cleanly break away from postulating a protecting film around the droplets.

The Phase Volume Theory. This assumes that the formation of either O/W or W/O type emulsions depends upon the relative volumes occupied by the two phases. Hence the greater the volume of water to oil, the greater the possibility that an O/W emulsion will form, and vice versa. This apparently is untrue, as internal phase emulsions of up to 90% are possible because of a wide range of droplet sizes and nonrigid interfaces, which can be deformed under stress of crowding, provided the interfacial film is strong enough.

The Solid Particle Theory. This assumes that solid particles accumulate at the interface and coat the globules. The theory offers no explanation as to how this accumulation occurs, and its merit lies only in the discovery that particles of fine subdivision can act as emulsifying agents.

The Adsorption Theory. This assumes that particles are adsorbed at the liquid interface and may migrate toward the surface from the inside or the outside. This accumulation at the interface invariably acts as a reducer of surface tension, and is called positive adsorption. The inverse, that of thinning out at the surface and accumulation in the interior of the liquid, is called negative adsorption and increases the surface tension.

(*concluded on page 36*)

Proceedings of the

American Association of Textile Chemists and Colorists

Copyright, 1959, American Association of Textile Chemists and Colorists

January 12, 1959

Committee on Damage Caused by Retained Chlorine———

DAMAGE CAUSED BY RETAINED CHLORINE

Tentative Test Method 92-1958

The Committee on Damage Caused by Retained Chlorine presents herewith a new tentative test method for determining damage caused by retained chlorine. This new tentative test replaces Tentative Test Method 69-52. It is the Committee's experience that more reproducible results will be obtained through the use of this new method. This new tentative test is more explicit in detailed instructions for carrying out certain operations of the test and also contains certain refinements of some variables in the procedure. The refinements and changes incorporated in this new tentative test are the result of a considerable amount of work by the Committee over the past six years. A comprehensive study has been made of the influence of such variables as pH, time, temperature and available chlorine concentration.

For background material on work leading up to the adoption of this new tentative method, the reader is referred to the report of the Committee, appearing elsewhere in this same issue, which was presented at the TCR Symposium at the 1958 AATCC Convention.

The present test was proposed at the September, 1958 meeting of the TCR, and was approved as the new tentative test method through letter ballot by TCR in October, 1958.

As explained in the TCR Symposium report, the Committee has found this method to give reproducibility within a laboratory. It also gives reproducibility between laboratories on fabrics showing a high or low level of susceptibility to chlorine-retention damage. However, on fabrics falling in the intermediate range of damage, the reproducibility between laboratories using this method is still not as satisfactory as it should be.

To this end, therefore, the Committee is continuing its work in further exploring the effect of the many variables of the test procedure. More specifically, much more experimentation needs to be done and is being done on the effect of rinsing procedures, drying times and conditioning times.

COMMITTEE

R F AURICH, chairman
P B ROTH, secretary
O C BACON
H R BELLINSON
D P FEYLER
S H FOSTER
D N KOENIG
J W MERRILL
T W MOONEY*
H H MOSHER
A C NUESSLE
W N PARSONS
L C REYNOLDS
R B SMITH
J G STASS
L L WALMSLEY
C L ZIMMERMAN

*Cooperating nonmember

PURPOSE AND SCOPE———This is an accelerated test to determine the potential damage caused by retained chlorine. It has been designed for use on cotton and rayon fabrics, but may be used on any fabric or finish that is not damaged by heat alone. *(1)*.

PRINCIPLE———The fabrics are treated in sodium hypochlorite solution, rinsed, dried, and pressed between hot metal plates. The damaging action of the retained chlorine is calculated from the difference in tensile strength before and after pressing.

APPARATUS AND REAGENTS

Beakers, 800-ml.

pH meter *(2)*.

Constant temperature bath (or suitable alternative means of controlling temperatures).

Wringer, laboratory or household-type.

Scorch Tester *(3)*.

Tensile-strength tester *(4)*.

Sodium hypochlorite stock solution, eg, Clorox, having an available chlorine content of approximately 5.0%.

Water, distilled.

PREPARATION OF SAMPLE ———Normally, only warpwise specimens are tested. Cut the sample approximately 14″ in the warpwise direction and 8″ in the fillingwise direction (if testing filling specimens, reverse these figures).

PREPARATION OF SOLUTIONS

Prewetting and Rinse Solutions. Determine the pH of the distilled water; if outside the range of 6 to 7, report the actual pH with the final results of test *(5)*.

Chlorination Solution. Prepare a chlorination solution containing 0.25% available chlorine at a pH of 9.5 ± 0.1 as follows:

Determine the percent available chlorine (Cl) of the sodium hypochlorite stock solution, eg, Clorox *(6)*.

Calculate the number of grams (Gm) of stock solution required to make one liter of a 0.25% available chlorine solution as follows:

$$Gm = \frac{1000 \times 0.25}{Cl}$$

where: Gm = grams of stock solution required,
Cl = % available chlorine determined.

To 900 ml of distilled water add the calculated grams (Gm) of stock solution required. Adjust the pH to 9.5 ± 0.1 by the addition of either sodium bicarbonate to lower the pH or sodium carbonate to raise it. Finally, add distilled water to make one liter and recheck the pH.

Figure 1
Scorch Tester

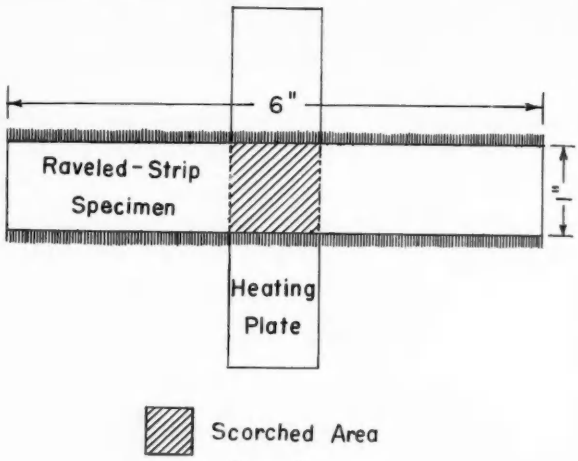


Figure 2

PROCEDURE———Because many factors, such as pH, concentration and time, significantly influence the amount of damage caused by retained chlorine, it is *important* to follow closely the conditions of the test. Should any deviations be necessary, they should be reported in order that the test results may be evaluated accordingly. As a means of checking the test procedure, it is well to run, at the same time, a cotton fabric whose chlorine-retentive properties have been determined previously.

A) Chlorination Step.

Prewetting Bath. Measure into an 800-ml beaker a volume of distilled water equal to 50 times the dry weight of the fabric sample. Immerse the sample for three minutes at 160 ± 5° (71 ± 3°C), stirring frequently. Remove sample from bath, allow to drain and cool to room temperature.

Chlorination Bath. Transfer the sample to an 800-ml beaker containing the chlorination solution (equal to 50 times the dry weight of the fabric) which is maintained at a temperature of 77 ± 2° F (25 ± 1°C). Agitate the sample frequently and gently with a glass stirring rod during the 15-minute chlorination period. At the end of 15 minutes, remove sample, allow to drain momentarily, and pass through a wringer, to remove as much solution as possible using care to keep the sample flat and free from wrinkles. Rinse equipment free of chlorination solution with distilled water, to avoid contamination of specimens during the subsequent rinsing procedure.

Rinsing. Immerse the sample in an 800-ml beaker containing distilled water (equal to 50 times the weight of the sample) at a temperature of 70-90°F (21-32°C) for two minutes, agitating the sample gently and continually. Remove the sample from the bath, allow to drain momentarily, and then pass through a wringer, as before, taking all precautions mentioned previously.

Repeat this rinsing procedure five more times, making a *total* of *six* rinses. For greatest precision, rinse *all* samples *separately*, to avoid danger of contamination.

Drying. Samples are to be *air-dried.* Hang on a line or dry flat on a non-corrosive rack, away from heat, until just dry (do *not* press!). Transfer at once to a conditioned atmosphere at 65 ± 2% rh and 70 ±2°F (21 ± 1°C) and allow to remain through the scorching step and tensile strength testing.

B) Scorching Step.

Prepare warp specimens by carefully cutting five strips approximately 14" x 1¼". Ravel the 1¼" strips to exactly 1" following ASTM Designation: D39-49 in preparing specimens. Then trim the 14" length to 12". From this set of five 1" x 12" strips, make two sets (from the same set of warp threads) of 1" x 6" raveled strip specimens by cutting the strips in two. These sets should be kept separate; one set is to be scorched, the other used as a control. The total conditioning time should be not less than four nor more than twenty-four hours.

Prepare Scorch Tester in advance so that the heating plates of the instrument maintain a temperature of 365 ± 2°F (185 ± 1°C). If necessary, to avoid air currents, enclose instrument in a cabinet. Make sure the two heating plates are clean and in good adjustment (uniformly in contact at all points). Scorch each strip of one set separately (one at a time) by placing the 1" x 6" specimen in the Scorch Tester with the long direction of the raveled strip perpendicular to the long direction of the heating plates so that it is scorched across the center of the raveled strip. (See Figures 1 and 2). Scorch the strips for 30 seconds. Check reading of the thermometers frequently during use. Condition the specimens again; this time conditioning at least 16 hours before making tensile strength measurements.

C) Tensile Strength.

Make tensile strength tests on the unscorched and scorched specimens and record the individual values. From these, calculate the average tensile strength for each set.

CALCULATION OF DAMAGE CAUSED BY RETAINED CHLORINE———Use the formula:

$$\frac{T_c - T_{cs}}{T_c} \times 100 = \%$$ loss in tensile strength due to damage caused by retained chlorine

wherein T_c = average tensile strength of chlorinated specimens, unscorched, and

T_{cs} = average tensile strength of chlorinated specimens, scorched.

NOTES———

(1) Where it is suspected that either fabric or finish is susceptible to damage on heating, this susceptibility can be determined by running a distilled water control. That is, the fabric is run through the entire procedure, but using distilled water in place of the hypochlorite solution. The loss in strength due to heat alone is calculated by the equation:

$$\frac{T_w - T_{ws}}{T_w} \times 100 = \%$$ tensile strength loss due to scorching alone.

wherein T_w = average tensile strength of the water-treated specimens, unscorched, and

T_{ws} = average tensile strength of the water-treated specimens, scorched.

If this loss is appreciable, there is some question as to whether the chlorine damage test is applicable.

It is usually not necessary to determine the effect of wet chlorination on the fabric, as this factor is canceled out in the calculation for chlorine damage. However, where it is desirable to determine the effect of the wet chlorination step, this may be calculated as follows:

$$\frac{T_w - T_c}{T_w} \times 100 = \%$$ tensile strength loss due to wet chlorination

wherein T_w = average tensile strength of the water-treated specimens, unscorched (handled as above), and

T_c = average tensile strength of the original fabric chlorinated and unscorched.

(2) Any standard laboratory pH meter having suitable provision for high pH readings. Colorimetric methods cannot be used with NaOCl.

(3) Available from Atlas Electric Devices Co, 4114 North Ravenswood Avenue, Chicago 13, Illinois.

(4) Example: A Scott tensile strength tester, having a suitable breaking-strength range.

(5) There is reason to believe that the pH of the prewetting and rinsing solutions may influence the results obtained in this test method. However, in view of the widespread variation of pH in commercial practice, the Committee on Damage Caused By Retained Chlorine is not as yet prepared to fix a specific value for the test procedure. Experimentation is being conducted on this point.

(6) For determining the percent available chlorine, pipette a 1.00-ml portion of Clorox into an Erlenmeyer flask and dilue to 100 ml with distilled water. Add 20 ml of 6N H_2SO_4 and six ml of 12% KI. Titrate with 0.1N sodium thiosulfate solution.

Calculation:

$$\frac{\text{ml sodium thiosulfate} \times N \times 0.0355}{1 \times \text{specific gravity NaOCl sol'n}} \times 100 = \%$$ available chlorine

FUTURE PAPERS

to Appear in the Proceedings

THE following list is comprised of papers submitted to date for publication in future issues of *Proceedings*. Authors and Technical Program Chairmen are requested to examine this list and call our attention to any omissions.

Papers Presented at the 1958 Convention

"Recent Developments in Dyeing Orlon"—L Bidgood Jr and W Bell, E I duPont de Nemours & Co, Inc

"Imparting Wrinkle Resistance to Cotton Fabrics with Triazone Derivatives"—J David Reid, J G Frick Jr, Robert M Reinhardt, and Richard L Arceneaux, Southern Regional Research Laboratory, USDA

"The Dyeing of Wool Pretreated to Produce Contrast Effects"—William Postman, A French Textile School, Georgia Institute of Technology

"Some Observations Regarding the Chlorine Retention of Fabrics Treated with Dimethylol Ethyleneurea"—A R Smith, BIP Chemicals Ltd

"The Use of Dieldrin for Mothproofing Application and Control"—J P Redston, E F Drew & Co, Inc

"Expanding the Market for Nonwoven Fabrics"—L L Shailer Jr, B F Goodrich Chemical Co

"The Finishing and Dyeing of Fiber Glass Drapery Fabrics"—Richard C Horton, J P Stevens & Co, Inc

"The Influences of Finishes on the Properties of Fiber Glass Tapes and Fabrics"—Edwin L Lotz, Hess, Goldsmith & Co, Inc

"Evaluating the Effectiveness of Fluorescent Whiteners and Oxidizing Bleaches on Cotton"—M S Furry, P L Bensing, J L Kirkley, R K Taube, N D Poole, and E S Ross, Clothing and Housing Research Div, USDA

"Evaluation of the Celanese Wrinkle Tester"—Ernest R Kaswell, Fabric Research Laboratories, Inc

"Optical Wrinklemeter"—Richard S Hunter and Clyde A Lofland, Hunter Associates Laboratory, Inc

"Evaluation of the Effectiveness of Antibacterial Finishes for Cloth"—Paul A Majors, Hill Top Research Institute

"Nonionic Detergents in Raw-Wool Scouring, Including Studies of Waste Clarification"—W Fong, Western Utilization Research and Development Div, USDA

Papers Presented before Local Sections

"Vat Dyeing of Cotton and Viscose Packages"—Klaus J Bardt, Ciba Co Ltd

"Quantitative Measurement of Fabric Appearance—Practical Evaluation of Wash and Wear Characteristics"—C R Williams, Monsanto Chemical Co

"Reactive Dyestuffs"—E L Caswell, Ciba Co, Inc

"Properties of Kodel Fibers"—E V Martin, Tennessee Eastman Co

"Dyeing and Finishing of Kodel Fiber and Fabrics"—W R Ivey, Jr, Tennessee Eastman Co

"Dyeing and Finishing Blends of Dacron Polyester Fibers and Cellulose Fibers"—C W Holweger Jr, J J Iannarone Jr and R J Thomas, E I duPont de Nemours & Co, Inc

Nonwoven Fabrics: The Technology of Bonding Agents"—John T Taylor, Rohm & Haas Co

Miscellaneous

Colour Index Additions and Amendments—Volume 1

Committee on Antibacterial Agents———

DETECTION OF ANTIBACTERIAL PROPERTY OF FABRICS AGAR PLATE METHOD

Tentative Test Method
90-1958

COMMITTEE

I SCHWARTZ, *chairman*
H E WILDE, *secretary*
C CROCKER
M T GOLDSMITH
M L HUCKABEE
L H JAMES
E N KRAMER
J M SALSBURY
M J SPANGLER
C C YEAGER

The procedure for "Detection of Antibacterial Property of Fabrics, Agar Plate Method," was developed by the sponsoring Committee after several years of extensive study and considerable interlaboratory testing, which proved the method reproducible. The method, accepted as an official AATCC Tentative Test (90-1958) by the Technical Committee on Research through letter ballot, is now presented to the membership at large.

Comments and suggestions concerning its application will be most welcome and should be directed to H E Wilde, secretary, P O Box 446, Westfield, N J

PURPOSE AND SCOPE———This method for the detection of the antibacterial property of fabrics is adaptable for a large variety of materials, but may not be adaptable for certain types of materials that have an impervious or impermeable film or materials treated with finishes and coatings that produce impervious or impermeable films. For materials with these unusual surface conditions, it may be found desirable to depart in certain particulars from these procedures or to use tests other than these here described.

PRINCIPLE———Any inhibition of bacterial growth is observed when a specimen of fabric is placed on the surface of FDA agar seeded with a standard strain of *Micrococcus pyogenes* var *aureus* and incubated at 37°C for 24 hours. Aseptic techniques must be followed.

TEST SPECIMENS ——— Test specimens of fabrics used are circular having a diameter of 1⅛ inches.

CULTURE MEDIA———

FDA Broth

Peptone (for disinfectant testing)	10 g
Beef extract	5 g
Sodium chloride	5 g
Distilled water	1000 ml

Boil the mixture for 20 minutes, make up to original volume with distilled water, cool to 70° to 80°C and adjust with NaOH to pH 6.8 using colorimetric method or pH meter. Filter through paper, tube (10 ml in each tube), stopper with cotton plugs or with screw caps and sterilize (autoclave) at 250°F (15 lb steam pressure) for 20 minutes.

FDA agar for slants for stock cultures and agar plates

Peptone (for disinfectant testing)	10 g
Beef extract	5 g
Sodium chloride	5 g
Agar	15 g
Distilled water	1000 ml

Boil the mixture for 20 minutes, make up to volume with hot distilled water (to prevent congealing), cool to 70° to 80° C and adjust with NaOH to pH 7.2 to 7.4. Keep the medium hot, filter if necessary through cotton, tube (15 ml for agar plates and 10 ml for stock cultures), stopper with cotton plugs or screw caps, and sterilize at 250°F (15 lb steam pressure) for 20 minutes.

TEST ORGANISM———*Micrococcus pyrogenes* var *aureus*, standard strain 209, American Type Culture Collection No. 6538. It must survive a phenol dilution of 1-60 for five minutes and a 1-70 phenol dilution for 15 minutes or show a minimum zone of inhibition when tested against a control fabric.

PHENOL DILUTION METHOD———The following is the minimal resistance required:

Phenol dilution	*Five Min*	*10 Min*	*15 Min*
1-60	+	0	0
1-70	+	+	+

Prepare dilutions of phenol 1-60 and 1-70 from a phenol solution standardized at five percent. The phenol used must be of USP grade. Dilutions of phenol are prepared as follows:

	Five percent phenol	*Distilled water*		*Five percent phenol*	*Distilled water*		*Five percent phenol*	*Distilled water*
1-60	20 ml	40 ml	or	10 ml	20 ml	or	4 ml	8 ml
1-70	20 ml	50 ml	or	10 ml	25 ml	or	4 ml	10 ml

Thoroughly mix each phenol dilution in nonlipped Pyrex tubes 25 x 150 mm and place these in a water bath maintained at 20°C. To each phenol dilution add 0.5 ml of the 24-hour broth culture of the test organism flaming the mouth of the tube before and after each addition. The culture is added from a graduated pipette holding sufficient culture to seed all the tubes. As a precautionary measure, the mouth end of the graduated pipette should be loosely plugged with cotton prior to sterilization. Unfiltered culture is used but it should be thoroughly shaken 15 minutes before use and allowed to settle. The temperature of the culture should be practically the same as that of the water bath before it is added to the phenol dilutions.

In inoculating the phenol dilutions, hold them in a slanting position after removal from the bath, insert pipette to just above the surface of the liquid and run in the culture without allowing tip of the pipette to touch the phenol solution. After adding the culture, agitate the tubes gently, but thoroughly, to insure even distribution of the bacteria, and replace in the bath; five minutes after seeding the first phenol tube, transfer one loopful of the mixture of culture and diluted phenol to the corresponding subculture tube. To facilitate transfers of uniform loopfuls, hold tube at 60-degree angle, and withdraw loop so that the plane of the loop is parallel with the surface of the liquid. (Figure 1).

In making loop transfers, a four-ml loop (inside diameter) is used, made of platinum or platinum alloy wire No. 23 B & S guage. Have other end in a suitable holder (glass or aluminum rod). Bend loop at 30° angle with the stem (Figure 1). Five minutes after making the first transfer, make the second transfer for the 10-minute period, and finally repeat for the 15-minute period. Gently agitate the phenol culture mixture before taking each interval loop for transfer to the subculture media. Before each transfer, heat loop to

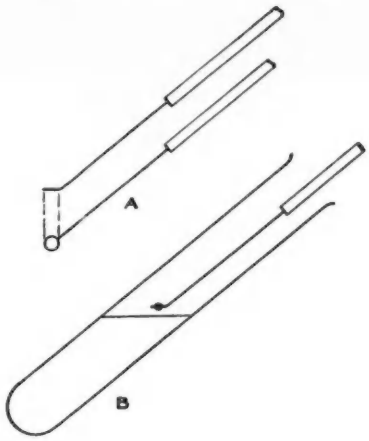


Figure 1

A—Type of needle used in the FDA test
B—The relationship of loop to the surface of the liquid on transfer

redness in Bunsen flame and flame mouth of every tube. Sterilize loop immediately after each transfer to allow time for cooling before making the next transfer. Use care in transferring and seeding to prevent pipette from touching sides or mouth of tubes. Thoroughly agitate individual subculture tubes before incubation. Incubate at 37°C for 48 hours. Survival of the test organism is indicated by turbidity.

CONTROL FABRIC METHOD ———An alternate procedure to test the activity of the culture is to use a control fabric with known antibacterial activity, preferably with not less than a three-mm zone of inhibition (halo). Each batch of seeded agar should be tested with this control fabric. The zone of inhibition (halo) observed with this control fabric should not vary by more than ± one mm.

MAINTENANCE OF CULTURE OF TEST ORGANISM———The test culture is transferred daily in FDA broth for not more than one month. At the end of each month a fresh transplant is made from the stock culture. The FDA agar slants on which the stock culture are carried are of the same composition as the FDA broth medium plus 1.5 percent of agar. The stock culture is stored at 5°C, transferred once a month and the test organism is taken from the month-old culture. When the test organism has not been transferred daily, it is advisable to make four or five consecutive daily transfers to be reasonably sure of its conforming to the phenol resistance requirements. When only one or two transfers have been skipped (as on weekends) the transfer from the previous broth culture is usually satisfactory for use after 24 hours. Phenol resistance tests are to be made periodically from one of the daily 24-hour-old cultures.

PROCEDURE———A tube containing about 15 ml of FDA agar is melted, cooled to 45°C, inoculated with 0.1 ml of a 24-hour-old culture of the test organism, and thoroughly mixed. The inoculated agar is poured into a sterile Petri plate and allowed to harden. The test specimen and an untreated control are pressed gently into intimate contact with the surface of the seeded agar using sterile forceps, care being taken to avoid breaking the surface of the agar.

The specimens are incubated for 24 hours at 37°C. The zone of inhibition (halo) is reported in mm and is measured conveniently as follows:

$$\text{Zone of Inhibition (halo), mm} = \frac{\text{Diameter of inhibition—Diameter of sample}}{2}$$

The test specimen is removed carefully with forecps without injuring the surface of the agar, and the contact areas are examined by means of a low-power microscope. Note any inhibition under the contact areas as complete inhibition, partial inhibition, or no inhibition. Zone of inhibition is to be reported separately.

In case of questionable results, the test is to be repeated, removing the specimen after two hours' incubation and incubating for an additional 22 hours. Note any inhibition under the contact area as complete, partial, or no inhibition.

NOTES———The peptone recommended is:

USP Peptic Digest of Animal Tissue;

Armour Peptone (quality specially prepared for disinfectant tests) CSMA grade.

Beef extract may be obtained from:

Oxo (USA) Ltd, 1330 Beacon St, Brookline 45, Mass.

Difco Laboratories, Detroit, Mich; and

Baltimore Biological Laboratory, Inc, Baltimore, Md.

Agar may be obtained from Baltimore Biological Lab and Difco Laboratories.

Dehydrated agar media and broth media are available from:

Baltimore Biological Lab

Difco Laboratories

(BACTO-AATCC Bacteriostasis Agar for FDA agar)

(BACTO-AATCC Bacteriostasis Broth for FDA broth).

Though the method calls for filtering the FDA agar and FDA broth, this can be dispensed with since the slight cloudiness will not affect the reading of the seeded agar plates.

Some fabrics, because of their construction, have a tendency to curl, thereby not making intimate contact with surface of the agar. To obviate this, sterile mechanical devices of the same size as the test sample, such as pieces of glass cut from microscopic-glass slides, or glass rings may be used to hold in place fabrics that do not flatten out and do not make intimate contact. With stubborn pieces of fabrics, intimate contact can be accomplished by placing a piece of glass slightly smaller than the sample of fabric on the fabric, and on top of this a section of cork is centrally placed with a drop of adhesive to hold it in place. The section of the cork shall be of such height as to project slightly above the rim of the bottom section of the Petri plate. The weight of the Petri plate cover resting on the cork will prevent the fabric from lifting.

REFERENCES———

(1) "Antiseptics, Disinfectants, Fungicides & Sterilization" by G F Reddish
(2) Definitions APHA, A M Paterson, *Am J Public Health*, 1932
(3) "Disinfection & Sterilization" by E C McCullough
(4) 1955 Tech Manual of AATCC

37th National Convention———

AATCC RESEARCH AT WORK*

A SYMPOSIUM SPONSORED BY THE TECHNICAL COMMITTEE ON RESEARCH

AATCC's Contribution to Industry through Research

CHARLES W DORN

Chairman, Executive Committee on Research

THE title of my talk this morning indicates that I am supposed to tell you about AATCC's contribution to industry through research. If I were to do this, I would be monopolizing the prerogatives not only of the other speakers on this program but those who have preceded us yesterday and the day before. Each of the speakers so far has told you about some contribution the Association has made to industry through research, and our speakers on this platform will be eager and enthusiastic in doing a good selling job.

So I am going to do a switch and talk about *industry's* contribution to AATCC.

Now these contributions are many and varied, ranging from intangible things to cold, hard cash, I would like to enumerate them briefly as they came to mind while I was preparing this talk.

In the first place, industry wants an AATCC, and the evidence points to the fact that it wants this one. I know I can speak for industry when I say that we need a technical society with the facilities and capabilities of providing the orderly development and dissemination of technical information, and more particularly, standard methods of test which can be used universally as yardsticks.

In order to accomplish this, there has to be the machinery to bring together the experience, the knowledge and the ideas of many men and women so that the best thinking in our industry can become available to us. AATCC is equipped to do this through its committee structure of some 70 research committees made up of nearly 500 individuals. It is industry which is contributing the time of many of its own people who serve on these committees, and if you tried to compute their salaries, their travel, and the work for the committees that is done in their own laboratories, it would come to an astronomical figure. And we in industry are glad to do this, for without nationally and even internationally recognized methods of test, we would indeed find ourselves in a chaotic situation.

The moral support industry gives AATCC is another kind of contribution. It is, of course, because of industry's own insistence that AATCC test methods are so widely used. There isn't a dye made in this country that is not influenced in one way or another by AATCC test methods.

I would like to describe all of the accomplishments of AATCC, but this would take far too much time. Nevertheless, let us look at a few of these accomplishments.

1) *Washfastness.* Under this heading AATCC has developed not only test methods for characterization of textile colorants but end-use tests for colorfastness of textiles to commercial laundering and domestic washing.

2) *Lightfastness.* The studies that have been made in this field have gone far beyond any other effort made by others throughout the world. These studies are continuing in an effort to improve not only Fade-Ometer tests but daylight tests as well. You will hear more about this subject later.

3) Working closely with the National Retail Merchants Association when the need arose, AATCC developed a test for the flammability of clothing textiles. This test forms the basis of Commercial Standard CS 191-53.

4) Recent accomplishments include a tentative method for evaluating the wash-and-wear characteristics of fabrics (badly needed by industry), a revision of the test method for damage caused by retained chlorine, a tentative method for the detection of antibacterial properties of fabrics, and a new tentative test method for dimensional change in woven textile fabrics (exclusive of wool), which provides four wash procedures similar to normal conditions of washing.

These with many others can give you an idea of AATCC research activities.

AATCC has worked closely with many other organizations, such as the American Society for Testing Materials, the American Standards Association, and the International Organization for Standardization, taking the leadership in this country on dimensional change and colorfastness of textiles. AATCC works closely not only with the NRMA, but also the National Fire Protection Association, various trade organizations, the Quartermaster Corps and various agencies of the Federal Government.

In 1955, AATCC, in cooperation with the Federal Civil Defense Administration, made a study of the effect of thermal radiation from an atom bomb on textiles. This study required months of preparation and a large amount of time in evaluating the results.

AATCC test methods form the basis of several commercial standards, are widely used in Federal specifications, and form the bulk of the test methods used in the proposed American Standard L 22, "Minimum End-Use Requirements for All Textiles."

Now let's take a look at what industry has contributed to this work in actual dollars. No matter how good a piece of machinery we may have, it takes people to run it, to keep it oiled and greased, and to see that machinery produces; and that is what AATCC does with the dollars that industry contributes. Over a 20-year period, AATCC has received a total of $680,000 in Corporate Member dues. The Association spent $689,000 charged directly against its research and technical activities.

*Held November 1, 1958 at the Conrad Hilton Hotel, Chicago, Ill, during the 37th National Convention.

While it spent $9,000 more than it took in, it also spent many thousand dollars to keep the research machinery in motion, and since everything AATCC does is related to research and technical activities, the Corporate Membership dues has never fully paid the bills. Back in 1939, the Association's income from its Corporate Members was a modest $2,800, and in the 20-year period following, this has been multiplied 20 fold or $56,000, which came in last year. Many of us have this question in mind. Is this enough to give industry what it wants from AATCC? We in industry will have to make the decision.

The pace of technological progress is accelerating and things are moving faster and faster every day. Our whole economy is geared to technological competition, and the industry that has the edge is going to be the industry that prospers.

This then reduces it all to a very simple formula—technical progress equals profits—and in our industry, even survival in some cases. I urge those companies represented here today who are not supporting AATCC's program with Corporate Membership dues to get behind the Association and enable it to do the kind of a job that is so urgently needed.

It will be of interest to you to know that the Association is taking a long, hard look at itself. It is saying "who are we, what are we doing, where will we be ten years from now"? AATCC recognizes that many of the traditional uses for textiles no longer exist and that substitute materials are moving in and taking over. Only recently the Executive Committee on Research has been considering the greater emphasis of textile uses in a general area of what might be known as "nontextile textiles." Plastics, paper, leather, glass —these are but a few of the things we must look at in terms of textile uses and perhaps relate them directly to AATCC's program. The Association's governing board has authorized the appointment of a special committee to study the Association's long-range objectives. This will do much to define and establish the direction in which AATCC will move in the years ahead.

AATCC is in a strategic position to take leadership, and by such leadership to render increasingly greater service to industry. It must keep ahead of industry's needs, it must anticipate them and it must do something about them. But in the last analysis, it is industry itself that must provide this leadership and support it. Strong leadership—more dollars—these are the contributions that industry can make to AATCC.

Analysis of Consumer Complaints

P J FYNN

Secretary, Committee on End-Usage Performance Tests

A YEAR or more ago a proposal was made before the Executive Committee on Research concerning a system of categorizing the various types of failures which occur to textile goods in consumer use. The proposal had considerable merit and it was referred to the End-Use Committee for investigation and development.

I'm sure many of us have had complaints concerning the merchandise sold by our companies. Any complaint is cause for concern but often there is not enough knowledge of the industry-wide experience with any particular type of complaint for us to judge whether we are really in trouble or whether it is just a case of a freak occurrence. From my own experience, one of the banes of existence is the article returned with a letter to the president of the company. The complaint instantly assumes undue importance and much expense and bother is entailed in finding a proper reply to the president. A periodic statistical industry-wide record of returned goods complaint would indicate whether or not the reason for return reflected a serious industry problem or just a coincidence of circumstances.

This points up the need for a service to the industry. It is just such a service that will be provided by the procedure currently proposed by the End-Use Committee. The Drycleaning Industry, through the National Institute of Drycleaning and Albert E Johnson, its representative, made available to the Committee an outline of a system for tabulating and classifying the types of textile product failures encountered by drycleaners. As modified by the Committee, this scheme now provides a simple, easily worked system of tabulating causes of consumer dissatisfaction. Two major divisions divide these causes into Fabric Failures on the one hand, and on the other, Consumer Misuse or Abuse, Garment Construction Faults and Faults in Professional Cleaning or Laundering. Each of the two divisions are further divided into Fiber, Color, Finish Failures and Damage Due to Extraneous Materials, such as spots and stains.

I am certain that the industry as a whole will profit by knowing how widespread certain failures really are.

Industry-wide statistics can give a clear picture of the recurrence and importance of some of the failures encountered. In our own work, we often wonder if ours is the only merchandise subject to certain ills. Are we the only ones who get stuck with draperies where the yellow-colored spots in the pattern crumble to dust after six months at the window? The propensity of certain yellow dyes to promote tendering of cellulose by sunlight has been known for decades. Is this trouble widespread enough to stir up the industry without records of occurrence frequency—who knows? Too many times goods are returned because pigment-colored goods turn white at the seams or get "crows feet" marks because the color is rubbed off in wear and washing—are we the only victims? How prevalent is it in the trade? I have a hunch, judging from returns, that there is a tendency toward using cheaper dyes, for color

failures crop up in applications and in circumstances where failures never used to occur. Is this part of an industry trend—another example of the alarming tendency the textile trades have for committing harikari? If the importance of these trends can be reversed, newly appearing problems can be recognized and corrected before the public becomes soured on a product by repeated but correctable failure. For instance, something in certain finishing agents, perhaps a softener, is incompatible with optical bleaches. We've had optically whitened goods turn yellow and brown on the counter before sale. Is this something that can be detected and arrested before lots of people lose money? Some dyes in the naphthol family were wonderful until a short time ago. Now they face a new hazard, victims of a modern trend in home furnishing—vinyl plastics. We had to buy a customer a new easy chair because a red corduroy shirt irrevocably stained the white vinyl upholstry. Another customer sued for a reupholstry job on his snappy and expensive sport car because the color came off a jacket but wouldn't budge off the upholstry. Statistics can point up such trends if they are trends.

Of course, statistics will never help solve some returned goods problems; shirts and sheets that have holes appear after one washing —nice holes, big and round and just as clean as if they had been cut with a cookie cutter. Some people never remember to add bleach until the washer has started. A true-life experience concerns one lady who returned an all-wool blanket. It was about the size of a desk top and stiff enough to stand on edge. She insisted that it had been washed as directed, by hand in warm water with soap chips. She wanted her money back. Her little boy, age four, had been pulling on her skirt and she impatiently asked what he wanted, whereupon the child said "Mommie, don't you remember, when you took it out of the washing machine you said the water was too damned hot?"

Be that as it may, the End-Use Committee feels confident that the new procedure for obtaining statistical records of causes for textile goods failures will prove useful in several ways. These are:

1) It will give textile producers, retailers, service companies, publications, educators, associations and others a more comprehensive picture of the kinds and frequency of performance problems that exist at the consumer level.
2) It will give laboratories a basis for better communication in dealing with the problems that mutually concern them.
3) It will result in a more consistent evaluation of all problems and in a fairer judgment of responsibility for them.
4) Trends in the new problems will show up more quickly and with a more accurate indication of their scope and direction than otherwise occurs.
5) And it will prove of immeasurable value in the development of test methods and in the setting of standards of performance.

The Committee requests all members who received returns in the form of consumer end-use products (except rugs) to take part in this use of the statistical forms. They are simple to use and will provide a system for you if one is not already in use and will be no burden if you already use a classification of returns system. All figures and information will remain confidential and be submerged into the general statistics.

The forms are obtained from and returned to the AATCC. Research Laboratories at Lowell, where you may also obtain a complete report of its plan.

Research Developments
Committee on Colorfastness to Light

JOSEPH E NORTON
Chairman

THE changes in color of a textile material due to the action of light is an extremely complicated process in which many factors contribute to the amount and type of color change produced. These factors include many which have been recognized previously and reported, others which undoubtedly have been reported improperly and credited with effects they themselves do not actually produce, and others which are as yet unrecognized or improperly identified.

To better study these, we, in the past year, have established four subcommittees within the Lightfastness Committee, each of which is concentrating on specific and limited areas.

Subcommittee I, under the chairmanship of C H A Schmitt, is studying both the AATCC Sunlight and Daylight test methods with a view to establishing statistically the limits of reproducibility and repeatability that may be expected by these methods and on possible modifications and improvements of both the methods and standards. In the preliminary work of the subcommittee, which was published last year, it was shown that the Sun Hour or any method of conducting natural-light exposures on a timed-exposure basis produced results which varied so greatly that they were of doubtful value or usefulness. At that time we stated that, while the langley method of exposure showed considerable promise, the AATCC Blue Wool Standards should be continued as the official method of reporting lightfastness ratings.

Since that time we have completed monthly exposures for twelve consecutive months at Phoenix and Sarasota, and for six consecutive months at Chicago. In this exposure series the same test specimens along with standards were exposed each month until they had each received a specified number of total langleys. The number of langleys for each specimen and standard was chosen as the number which from previous work had been found to produce a color change between steps 4 and 3 on the ISO Grey Scale. As the exposures were not

completed until August of this year we have not as yet had sufficient time to rate all of the specimens and make a statistical analysis of the data.

A casual preliminary examination does, however, indicate that, unless the specimen is sensitive to moisture and/or atmospheric contaminants, very good correlation exists between the 30 different monthly exposures. Of the dyestuff-fiber combinations tested, the majority did show excellent correlation. There are a few of the specimens and the lower-numbered standards which show from moderate to considerable variation in the 30 different monthly exposures. It would therefore appear that good results on the majority of specimens can be obtained by use of the langley method and that on the remaining small percentage of specimens the langley method is at least equal to the method of rating by our present standards. Actually, data will be presented which should permit conversion of langleys into the numerical ratings assigned by use of the standards.

Since some may not be entirely familiar with the langley method, a brief description of it follows:

Langley units of radiation, as measured by the Eppley Pyrheliometer and suitable recording and integrating equipment, are a measure of the total amount of radiation received. While we usually refer to a sample as having received a given number of langleys, the term langleys is actually an abbreviation of "langleys/minute". A langley/minute is technically defined as one gm cal/cm^2/minute. Thus if the intensity of the radiation is one gm cal/cm^2, in one hour we would have 60 langley/minutes or, as it is more commonly used, 60 langley units of radiation. At an intensity level of 0.5 gm cal/cm^2 we would in one hour receive 30 langley/minutes or 30 langley units. The radiation intensity from sunrise to sunset will of course vary from minute to minute so that integration of the intensity and time is necessary in order to express the amount of radiation the sample has received.

As soon as the analysis of this work is completed, a formal report will be made by the subcommittee.

Subcommittee II, under the chairmanship of Lindsay Chase, will study laboratory methods with a view to improving their correlation with natural light tests. A report by the chairman and his associates, "A Critical Evaluation of Some of the Various Methods of Conducting Lightfastness Tests" has been turned over to the subcommittee for study and further work. This report briefly indicates that our present carbon-arc-lamp method produces results which, in general, are in good agreement with the results of our Sunlight Exposure Method, where the samples are exposed under glass only between the hours of 9 a m and 3 p m on sunny days.

It does, however, indicate that better correlation with the daylight test can be obtained by the use of a carbon-arc-lamp machine, which has been modified to produce different test conditions. While the daylight test in which the samples are left in the test cabinet 24 hours a day is, we believe, a more realistic test, it does, on moisture-sensitive specimens, produce different results than does the sunlight test. In the daylight test the samples are subjected to a day and night cycling effect. Early in the morning the test specimens receive low-level radiation while at a low specimen temperature and a high moisture content. Then, as the sun rises, their specimen temperature increases and their moisture content decreases. The preliminary work as reported indicates much better correlation with daylight exposures can be obtained by modifying the Fade-Ometer so that it can be operated on a cycle of 3.8 hours of light at a black panel temperature of 145°F followed by a period of one hour during which the arc lamp is turned off and the relative humidity in the test chamber is raised to and maintained at 85 to 95%. Also covered in the report are the results of exposures made under other conditions and in other types of equipment.

While this report indicates that improved correlation with daylight exposures can be obtained by using a cycling arrangement in the Fade-Ometer, it should be emphasized that this report covers only the work done by one laboratory, and before any such method could be adopted it would be necessary to verify the results by exposures in a number of different machines and laboratories.

Subcommittee III, under the chairmanship of Victor S Salvin, is investigating the combined effects of light and atmospheric contaminants and a report of this preliminary work was published in the June 30, 1958 issue of *American Dyestuff Reporter*. From this and subsequent work it is now believed that information may be developed which will be of great help in explaining some of the reasons for the wide variations encountered on some materials in natural light exposures and particularly the daylight exposures made at different times and locations.

There are indications that there is a cumulative effect of light combined with atmospheric contaminants which does not occur when the various factors are applied individually. In many cases peculiarities in fading have been attributed to moisture sensitivity. We now believe that these may actually be caused by atmospheric contaminants whose activity is, of course, greatly increased by the presence of higher amounts of moisture which is encountered during the night in the daylight test.

Special equipment for studying the combined effects of light and controlled concentrations of atmospheric contaminants will, in the near future, be made available for use by the subcommittee. Since it may be possible in some cases to modify a dyestuff to provide better resistance to light and atmospheric contaminants, a thorough study of this together with the possible development of a test method and special equipment for evaluating such properties should, in the long run, be very beneficial to the textile industry in improved colorfastness.

Subcommittee IV, under the chairmanship of Edwin J Grajeck, is concerned with Colorfastness to Weathering of Textiles. This subcommittee will deal only with colorfastness to weathering as differentiated from the physical changes in textile materials due to weathering, which is being studied by the Weathering Committee.

Since no such method has been developed previously by our Association, it will be necessary for this subcommittee to initiate work designed towards developing a standard method for conducting colorfastness to weathering tests. The subcommittee will cooperate with the ISO, which, through member countries, has already done considerable work on such a method, which utilizes a set of vat-dyed standards, and which they claim to be suitable for this purpose. At the same time, the subcommittee will investigate possible laboratory methods to duplicate the results of actual weathering tests.

The Lightfastness Committee thus has many rather complicated and unsolved problems. Many of you or others in your respective organizations undoubtedly have made similar investigations and are therefore in a position to make invaluable contributions to the thinking and work of our committee. May I therefore extend an invitation to these people to join in the work of the Committee.

Research Developments
Committee on Damage Caused by Retained Chlorine

RICHARD F AURICH
Chairman

FOR the past year and a half, the Committee on Damage Caused by Retained Chlorine has been engaged in a comprehensive program to achieve its goal of devising a test method for determining the susceptibility of fabric or finish to damage from retained chlorine. In the interest of time, we would refer you to our previous report, as it appeared in the June 3, 1957 issue of *American Dyestuff Reporter*, for a detailed outline of the program in which we are currently engaged. Very briefly, however, the basic features of our program are twofold: 1) the simultaneous exploration of the different facets of the problem by six task forces or subcommittees, and 2) the investigation of certain aspects of the problem, particularly with respect to the precision of a revised test procedure, through an established research project at Lowell.

Our problem, of course, is to devise a test method for determining the susceptibility of a fabric or finish to damage from retained chlorine as might occur in laundering—home or commercial. It is implicit that the method be reproducible within and between laboratories, be correlated to a reasonable degree to what takes place in practice, be adaptable to routine laboratory techniques, and be rapid. To satisfy these generally accepted qualifications for a laboratory test method, we necessarily must produce an accelerated test—accelerated in the sense that the susceptibility to chlorine-retention damage be determined without carrying through an actual series of launderings and pressings to fabric failure or some predesignated decrease in fabric tensile strength.

The committee has at present achieved most of these prerequisites. However, the most elusive has been reproducibility between laboratories. We have achieved reproducibility within a laboratory, and reproducibility between laboratories on fabrics showing a high or low level of susceptibility to damage. More recent work of the Formulations Subcommittee as shown in Table I would confirm this. Here we see the results obtained on a cotton treated in one instance with a triazone resin; and, in the other, with a straight urea-formaldehyde paste. Within reasonable limits of error, the agreement is rather good.

TABLE I
% Loss due to retained chlorine

	Laboratory					
	A	*B*	*C*	*D*	*E*	*F*
Triazone	7	6	3	8	15	2.9
U F	87	100	91	94	100	92.5

However, on fabrics or finishes falling in the intermediate range of damage, our reproducibility between laboratories is rather unsatisfactory, and it is with this intermediate range that many of us are most concerned, ie, predicting the laundering performance or susceptibility to damage of questionable fabrics.

Our present program was essentially established to solve the problem posed by lack of reproducibility between laboratories and correlation with practice. After a great deal of effort, the Formulations Subcommittee produced a resin-finished fabric carefully designed to give damage in the intermediate range; and the various other subcommittees, viz, the Prewetting and Chlorination Subcommittee, the Rinsing and Scorching Subcommittee, and the Usage Subcommittee are now simultaneously experimenting and carrying out their planned investigation on this fabric.

In essence, the method for determining the chlorine-retentive characteristics of a textile fabric or finish consists of five main steps: 1) prewetting; 2) chlorination per se wherein time, temperature, pH. liquor to cloth ratio, and available chlorine concentration are specified; 3) rinsing; 4) scorching at 365°F for 30 seconds; and 5) tensile strength determinations before and after scorching after proper conditioning. It is to be appreciated that four of the five main steps of the procedure are quantitative in the sense that an attempt is being made to limit or control a reaction or to measure the effect of such a reaction. It is therefore obvious that errors introduced through lack of precision or specification can be readily cumulative. Also, certain of the operations must, by their very nature, have limitations placed on them, eg, the chlorination must be limited to preclude degradation through oxycellulose formation, and scorching conditions must be specified short of pyrolysis degradation in heating untreated cellulose.

It was early suspected in the work of the Committee that the numerous variables in certain steps of the procedure would have to be more precisely defined. As an outgrowth of the interlaboratory testing conducted by the Formulations Subcommittee in arriving at a formulation to be used in its work in preparing a standard resin-treated fabric, it was noted that certain laboratories would obtain consistently high or consistently low results in accordance with our previous statement of reproducibility within a laboratory being an accomplished fact. Acting on the suggestion of certain Committee members Lowell, as part of its work on the chlorine-retention project, was requested to monitor the actual performance of the testing at those laboratories securing the mose widely divergent results. It was hoped that some glaring deviations from the method or some gross differences in performance of the test where directions are not explicit would be uncovered, thus enabling a certain curtailment to be made in the necessarily heavy work load of those subcommittees investigating the procedure per se. Such a study was conducted, but our hopes were not realized. Although there were minor differences uncovered in the manner of performing the test, the main conclusion to be drawn from the study was the reaccentuation of the necessity for carefully exploring the loosely defined or ill-defined variables in the test method, especially in the chlorination and rinsing steps of the procedure.

For some four years now, the Committee has been using a so-called Revised Test Procedure in its work and in interlaboratory tests. This Revised Test Procedure differs from

Tentative Test Method 69-52 for measuring damage due to retained chlorine as it now appears in the *AATCC Technical Manual* in that it is more explicit in detailed instructions for carrying out certain operations and also contains certain refinements of some variables in the procedure. In view of the results to questionnaires the Committee has circulated on several occasions, which have pointed up the necessity for better defining the variables and for being more explicit on instructions that are capable of misinterpretation, and on the basis of the results of an extensive investigation of the variables in chlorination conducted by the Prewetting and Chlorination Subcommittee, our Committee has recently drawn up and submitted to the Technical Committee on Research a new Tentative Test Method (92-1958) for determining susceptibility to damage caused by retained chlorine. (See pages P5 to P7 of this issue of *American Dyestuff Reporter*).

The importance and effect of certain of the variables in the chlorination step of the procedure may be seen in Figures 1, 2, 3 and 4. In Figure 1, the percentage tensile strength loss due to retained chlorine is plotted against varying the chlorination temperature from 67°F to 97°F. As may be seen, even in this small spread of 30°, the tensile strength loss changes considerably. In Figure 2, the tensile strength loss is plotted against chlorination bath pH from a pH of 8 to a pH of 11. Figure 3 shows the effect of varying the available chlorine concentration; and Figure 4, the effect of varying the time of chlorination. Thus may be seen the importance of defining quite precisely the conditions of chlorination, especially, of course, with respect to temperature, pH, time, and available chlorine concentration.

As a result of this work, in addition to the previous specifications for time, temperature, and available chlorine concentration, we have also specified the pH at 9.5 $\pm$ 0.1. There are additional refinements in the instructions for drying specimens after chlorination conditioning times, after chlorination before scorching, preparation of samples, and rinsing. Although we lack the specific experimental data for these latter points, much of our past work has indicated the necessity for more precisely defining conditioning times, rinsing procedures, and drying times. This, of course, is also consistent with the theoretical aspects of the chlorine-retention problem wherein,

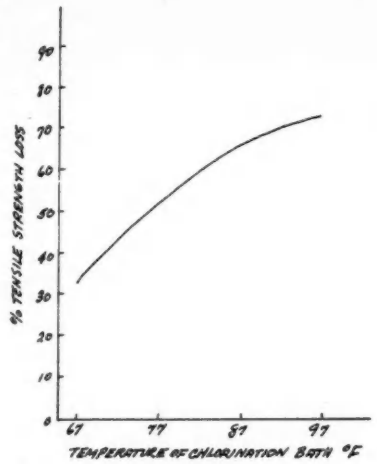


Figure 1
Effect of a temperature variation in the chlorination bath upon tensile strength loss

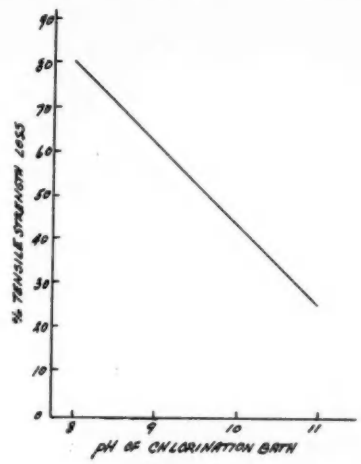


Figure 2
Effect of varying the pH of the Chlorination bath upon the loss in tensile strength

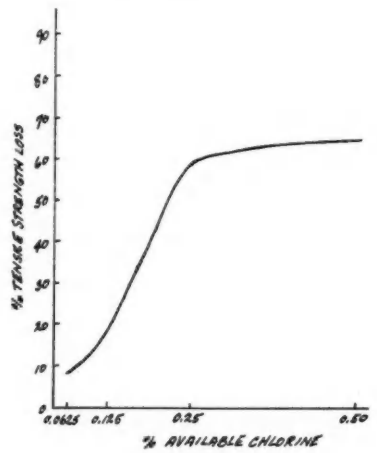


Figure 3
Effect of varying the NaOCl concentration upon tensile strength loss

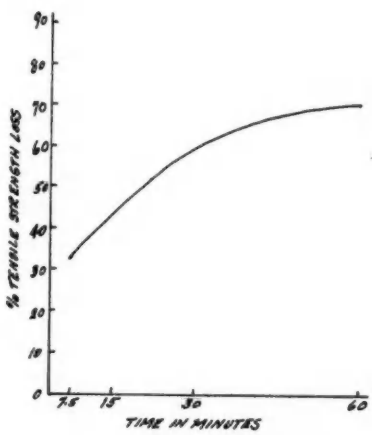


Figure 4
Effect of varying the time of chlorination upon the loss in tensile strength

after the formation of the chloroamide, we must be concerned with its stability during rinsing, drying and conditioning. Experimentation is continuing along these lines by the Committees concerned with those aspects of the problem.

In the new Tentative Test Method we have also attempted to clear much of the confusion that exists with respect to the calculations involved in chlorine-retention damage. Just as the name of the Committee implies, we are attempting to measure the damage due to retained chlorine. This damage takes place during the scorching step of the procedure or in practice during the ironing or pressing of the bleached fabric. Care must be taken not to confuse this damage with damage that might occur during wet chlorination or damage that could be attributed to heat susceptibility of the fabric or finish.

To clarify the picture on the calculations involved, it would be well to consider the possibilities involved in calculating damage due to retained chlorine. Diagrammed in Table II are the main reference points that are considered in chlorine retention calculations.

Essentially there are the initial tensile strengths of an untreated (U_o) and treated (T_o) fabric; then, the untreated and treated fabric subjected to just plain scorching (U_s and T_s). After chlorination of the untreated and treated samples there are obtained U_c and T_c; and after subsequent scorching of the chlorinated sample there are obtained U_{cs} and T_{cs}. We are ignoring for the moment the additional complication of consid-

TABLE II

A) Plain Bleached Fabric
Untreated (U_o) → Scorched (U_s)
↘ Chlorinated (U_c) → Chlorinated and Scorched (U_{cs})

B) Treated or Finished Fabric
Treated (T_o) → Scorched (T_s)
↘ Chlorinated (T_c) → Chlorinated and Scorched (T_{cs})

ering water controls.

Considering, then, the symbols thus established, it might seem logical to compute chlorine-retention damage as follows:

$$\frac{U_o - U_{cs}}{U_o} \times 100 = \% \text{ loss}$$

$$\frac{T_o - T_{cs}}{T_o} \times 100 = \% \text{ loss}$$

where the strength loss of the chlorinated and scorched sample from the original is taken as the basis for computing damage. In doing so, however, we are ignoring possible damage from wet chlorination and the possible heat damage susceptibility of any fabric in question—both types of which would be included in the damage loss calculated if the above equation were used.

To preclude including these two potential types of damage and consistent with the definition of damage due to retained chlorine, viz, that damage that manifests itself on a chlorinated fabric when scorched or pressed, the only equation that satisfies this description is as follows:

$$\frac{U_c - U_{cs}}{U_c} \times 100 = \% \text{ loss}$$

$$\frac{T_c - T_{cs}}{T_c} \times 100 = \% \text{ loss}$$

In the equation we are measuring the tensile strength loss sustained in the scorching or pressing operation, wherein the chloroamide is converted to hydrochloric acid, which hydrolyzes the cellulose, resulting in fabric tendering. This loss must be computed from the tensile strength of the fabric chlorinated in order to preclude the effects of shrinkage and the aforementioned damage from wet chlorination.

Inasmuch as any damage due to heat susceptibility of a fabric or finish would and could be included in such a calculation, there is a school of thought that maintains the calculation to determine damage due to retained chlorine should be as follows:

$$\frac{T_s - T_{cs}}{T_s} \times 100 = \% \text{ loss}$$

wherein the original fabric scorched and not chlorinated is the reference point for calculating damage ie, the scorched and chlorinated tensile strength figure is subtracted from the original fabric scorched only in determining loss. However, using this calculation, there is the danger of perhaps masking actual chlorine-retention damage. This could happen if the original fabric scorched did demonstrate damage from scorching alone, and then the materials responsible for this damage were removed in the chlorination and rinsing steps of the procedure. Thus, any tensile strength loss sustained, short of the original scorch damage, is very probably due to actual damage from retained chlorine, but this manner of calculating would in fact give a negative number or a gain.

In general, scorching susceptibility under conditions of the scorching step of the test on finished cottons and rayons is a rare event. However, anticipating those rare occasions, there is included in Note 1 of the method provision for determining the heat susceptibility of a fabric or finish so suspected. This note provides for running a distilled water control test and using the following equation:

$$\frac{T_w - T_{ws}}{T_w} \times 100 = \% \text{ loss}$$

where T_w = tensile strength of water-treated specimens unscorched

T_{ws} = tensile strength of water-treated specimens scorched

If this loss is appreciable, of course, there is some question as to whether the chlorine-damage test is applicable.

Although it is usually not necessary to determine the effect of wet chlorination alone, as this factor is canceled out in the calculation for chlorine damage, there is also provision in Note 1 of the Method for determining this feature. Thus, where it is desirable to determine the effect of the wet chlorination step, it may be calculated according to the following equation:

$$\frac{T_w - T_c}{T_w} \times 100 = \% \text{ loss}$$

where T_w = tensile strength of water-treated specimens unscorched

T_c = tensile strength of chlorinated specimens unscorched

In this equation, the tensile strength of the water control is compared to that of the fabric chlorinated only.

Thus may be seen many ramifications involved in the calculation of chlorine-retention damage, and the confusion that has arisen in many quarters concerning same is perhaps better understood in light of the foregoing explanation.

However, after consideration of many of the possibilities, it is perhaps well to consider again the calculation adopted by the Committee and set forth in the method for calculating the damage due to retained chlorine:

$$\frac{T_c - T_{cs}}{T_c} \times 100 = \% \text{ loss due to retained chlorine}$$

where T_c = tensile strength chlorinated specimens

T_{cs} = tensile strength chlorinated and scorched specimens

To summarize, we are herein calculating the damage due to retained chlorine as occurs in the scorching step of the procedure, and to preclude effects of wet chlorination, shrinkage, etc, the reference point for calculating this damage is the tensile strength after chlorination. Separate provision is made in Note 1 of the Method for determining any damage to heat susceptibility.

It may be noted that this calculation is sufficient in itself. That is, it is not involved in any way with an untreated fabric, since it must be borne in mind that many users of the test method have no untreated fabric or controls available and are interested only in the chlorine-retention performance of the particular sample with which they are dealing.

It must be remembered that this Tentative Test Method is a tentative test—that experimentation on many facets of the problem is continuing by the various subcommittees charged with exploring different facets of the problem. It is to be hoped that the results obtained may enable us to further pin down the effect of the many variables that play a role in the phenomenon of chlorine retention and enable us to so refine the method as to make it one that does satisfy all the prerequisites previously covered as being necessary to an acceptable test method.

Research Developments Committee on Drycleaning Test Methods

ALBERT E JOHNSON
Chairman

THE two new drycleaning tests that appear for the first time in the *1958 Technical Manual of the AATCC* are not actually new. They were published in the *American Dyestuff Reporter* in November 1957 and so have been in effect for a year. But they will be getting their first real use now and in that sense they are brand new additions to AATCC's store of test methods.

For my discussion this morning I would like to comment briefly on some aspects of these procedures and to tell you something of our experience with them so far as a guide to those of you who will be using them for the first time.

To begin with, it will be noted that perchlorethylene was selected for use in TTM #85-1957, Colorfastness to Drycleaning, to replace the carbon tetrachloride called for in the older drycleaning test. The reason for this is that CCl_4 is no longer used for commercial drycleaning. The newer chlorinated hydrocarbon is used in nearly half of the some 35,000 drycleaning plants in United States and Canada. Stoddard solvent still accounts for a somewhat larger total volume of cleaning done, however, but synthetic solvent equipment sales are considerably greater than those based on the use of petroleum solvent. Thus we can expect an even greater volume of synthetic solvent cleaning in the future.

But the more decisive factor governing the Committee's decision on what solvent to use is the fact that the action of perchlorethylene on some colors and finishes is faster than Stoddard solvent. As a general rule, anything that is unaffected by perchlorethylene is not affected by its counterpart. Consequently, a textile that shows good colorfastness in this new test is an indication of good colorfastness in all drycleaning plants.

By way of further comment on this point, it is well to understand that these solvents are not interchangeable. The equipment designed for one solvent cannot operate with the other. For this reason it is impractical to specify drycleaning in Stoddard solvent only, should one consider the expedience of labelling a product for selective handling. In other words, the instruction would impose a burden upon the consumer to locate a plant that can do the job.

MODIFICATION BEING STUDIED———Those of you who stopped by the Drycleaning Committee's exhibit may have taken note of the fact that TTM #85-1957 correlates more closely with one drycleaning than with three drycleanings. There can be some question, therefore, that the new procedure actually "indicates the effect of repeated drycleanings". There is some difference of opinion among laboratories for this reason whether the test is severe enough to give a true indication of probable performance under field conditions. In one instance, the laboratory has modified the procedure by running it at 115°F.

During the year we experimented with a number of modifications, such as repeating the test three times, running it continuously for long periods, and introducing a piece of sheeting cloth about seven inches square to augment the abrading action of the steel balls. None of these seems to remove any more color than the test does as it is written.

Very recently we stumbled on the theory of running the test at a high temperature, and while our information on the use of this technique is not complete, the exhibit shows good correlation with three drycleanings is obtained at 140°F. If further study should prove the advisability of this step, it will be simply a case of instructing that the test be run at the recommended temperature in the Launder-Ometer, rather than at room temperature as presently called for.

It should be explained that we have worked mainly with pigment colors of known characteristics as to colorfastness in drycleaning. We do not know what effect a solvent temperature of 140°F would have on other color types. It is significant, however, that the color portions of the samples tested which are not pigment or which are pigments that are fast to actual drycleanings, were not affected by the modified procedure.

It may be of interest to you that the discovery of this principle was in a way accidental. William Masterson, technical director of the Better Fabrics Testing Bureau and a member of the Committee, was confronted with a complaint of color loss in drycleaning, which he could not duplicate in any way on a sample of the same material in its original state. Test #85 failed to show any color change. On a suggestion to test the sample in a beaker of hot perchlorethylene, Mr Masterson went the limit. He brought it to the boil or 250°F. It exaggerated the effect, to be sure, but it showed the same direction the complained-of color loss had taken. A beaker procedure at a lower temperature came closer to the effect he wanted to duplicate. Thereafter we ran other samples in the Launder-Ometer at 120°F and 140°F with the best results noted at the higher temperature.

As the new test does not evaluate staining, it may be well to explain that very few colors actually exhibit any tendency toward staining in drycleaning, except the migratory type of stain that sometimes occurs in contrasting sections of a garment. But there is a tendency for dissolved or loosened color in the small amount of solvent used in the test to redeposit on the test cloth unrealistically, making it difficult to know how to interpret the result. In commercial drycleaning equipment, loosened color is flushed away as quickly as it comes off the fabric by continuous filtration of the solvent.

DURABILITY OF APPLIED DESIGNS AND FINISHES———So much for colorfastness to drycleaning. The Committee found that, in testing textiles which have a third-dimensional effect such as flocking, metallic designs, and other surface applications, the important thing was to simulate the abrading action of the drycleaning washer. Solvent is a factor also, but the rubbing action of cloth against cloth in a washer is a primary cause of removal of these effects.

We finally adopted the steel-cylinder-jar apparatus, which was originally developed for the accelerated washfastness tests. The larger size of the container, the 100 steel balls, and different mechanical action it supplies were found to simulate more closely

the mechanical effect of a drycleaning washer than did the mason jar used in the colorfastness procedure.

We are aware that the test is still somewhat milder than three drycleanings, as the exhibit showed, but we have done very little to determine whether the effect can be increased. Our own laboratory and that of Sears, Roebuck's New York office have reported good experience with this test. We hope that, as it finds greater use this coming year, there will be a better indication of the improvements that need to be made.

Incidentally, the reason Stoddard solvent is used in one of the three cycles specified in the test is because there have been some reports that finishes have been known to be affected by Stoddard solvent which were unaffected by perchlorethylene. We have not seen actual examples of this, and knowing something of the greater solvent activity of perchlorethylene, this is difficult to believe. But the test provides for such a possibility, and we would be interested in hearing of any report of such an occurrence.

SHRINKAGE TEST———Odd as it may seem, AATCC has never had a shrinkage-in-drycleaning test. Perhaps this is because people have always assumed that shrinkage does not occur in drycleaning; that if it does, it is the drycleaner's fault.

The fact is, however, that shrinkage *does* occur in drycleaning, depending on the type of shrinkage that is latent in the fabric. These might be grouped as follows: felting shrinkage (wool), relaxation, and yarn swelling. When his equipment is properly controlled, the drycleaner should have no real difficulty with wool felting. Also, yarn swelling is no problem as there is no real wetting of the fiber with water. But a fabric that is overly stretched in manufacture will tend to relax in the drycleaning washer, even more so in steam pressing. Right now, wool and wool-Orlon jersey dresses are coming to our Analysis Dept in increasing numbers on complaints of shrinkage. Investigation shows that some jerseys shrink as high as 8% in simple steaming; others are very stable at shrinkages under 2%. Very recently we found a Saran drapery that shrinks only in perchlorethylene. The question here is: Does solvent swell some types of fibers to cause yarn-swelling shrinkage? Or is the action one of softening of the yarn to allow a reversion to former molecular arrangements? In other instances, heat will cause relaxation in some of the newer fibers, as we all know. Whatever the cause, the fact is that shrinkage problems do exist in drycleaning, and the Committee will try in the coming year to produce a test which will attempt to simulate the several factors that appear to have a bearing on the problem. We have some data already on six fabrics, but we felt we were not ready to present anything as yet in the exhibit. Perhaps we can do this next year in Washington when at the same time the National Institute of Drycleaning will be pleased to be host to AATCC visitors.

CONCLUSION———As this is a general session on the work of AATCC Research and not a strictly technical one, I feel privileged to close with these general observations.

There is reflected in the work of our Committee, and that of the other Committees represented in this session, a trend toward greater interest in the end-use significance of test results. Time was when the two requirements of a test were official status and reproduceability. The third dimension of correlation with end-use is now coming into increasing importance. Speaking both as chairman of a research committee and as one who has spent twelve years in deep concern with the problems of end-use performance of textiles, I am perhaps more aware of this need then might otherwise be the case for continuing research in test improvements to assure that industry has available to it the best possible information on how well its products will serve their users.

But further than this, I am also chairman of the National Corporate Membership Committee, which is concerned with the problem of financing the kind of AATCC research program which will fully satisfy these needs for modern tests and, just as important, the need for up-to-date information on the significance of their results. It seems to me, therefore, that the great challenge in the coming years is in knowing more of what happens to textiles in consumer service. And to this end the need for AATCC Research services will be greater than ever.

Research Developments
Committee on Colorfastness to Washing

RALPH B SMITH
Chairman

THE textile industry uses test procedures for the control of manufacturing operations and the quality of the finished product. They are used in the evaluation of new fibers, fabrics and finishing treatments. They form an integral part of the specification of textile properties in informative labeling, in American Standards L22 and L24, and in the standards of the Textile Distributors Institute. It is the primary function of the various AATCC technical subcommittees to develop and revise such test procedures.

The fastness of dyed fabrics to washing is one of the important properties of a textile. It is interesting to note that, in 1922, only one year after the AATCC was founded, a Washfastness Committee was organized and the development of the Launder-Ometer, which is described in the October 28, 1928 issue of *American Dyestuff Reporter*, marks the beginning of reproducible test procedures for washfastness. During this period and for many years thereafter, there were separate washfastness tests for cotton and linen, for silk, for wool and for manufactured fibers. Today we recognize that washfastness is an end-use property and that the test procedures used must be independent of fiber content.

The washfastness tests for cotton and linen as developed in the early 1930's were essentially the same as the present Standard Test Method 36-1957; however, over the years certain changes have been made to make the method more accurate and reproducible. Rubber balls have been replaced with those of stainless steel. The multifiber test fabric and the

color transference chart have made possible a better evaluation of staining and finally the International Grey Scale made possible a simple and accurate method of measuring small color differences.

The colorfastness test for dyed or printed cotton and linen as given in the *1944 Technical Manual of AATCC* carries a footnote which reads in part . . . "It has recently been demonstrated in the textile field that a Launder-Ometer test such as described in this Standard is not sufficient to identify the colorfastness of pigment colors which may have been improperly cured". This condition and the further realization that the test procedures were not adequate to predict the washfastness of dyed or printed fabrics to commercial or home laundering led to a decision to do sufficient work on the problem to produce a test which could be relied upon to give real information as to the washfastness of colored fabrics. The first work carried out under this program was with 41 dyed or printed fabrics which had good-to-medium fastness to commercial or home laundry washing at a temperature of 120-140° F without bleach. These samples were washed in commercial laundries throughout the country by the methods which they regularly employed for fabrics of the type submitted and by six laboratories using home-washing procedures.

Samples were removed from each test fabric after one, five, 10, 15, 20, 25 and 30 washings, the thousands of individual samples which resulted were rated for loss of color, and the average amount of color removed was established statistically.

The median values for the various samples were used by the AATCC Research Laboratories as reference standards in developing a laboratory test which would correlate with the results of actual laundering. Many of the original panels which were made up during the development of the Associated Washfastness Tests are to be seen at our Committee's exhibit.

It was obvious at the beginning of the laboratory work at Lowell that a Launder-Ometer equipped with glass jars would not give enough mechanical action to duplicate in any reasonable test period the average amount of color removal produced by repeated commercial or home laundering. The present test method, using the stainless-steel jars, stainless-steel balls and low liquor ratio, was evolved only after a very considerable amount of laboratory work.

The same technique which resulted in the III A Test was used in developing the test method for the colorfastness of fabrics washed at 160° F using bleach and for fabrics washed with a short formula at 100°F without bleach. These tests are the present Standard Test Method 61-1957 Accelerated Test Nos. II A, III A, and IV A.

The accelerated washfastness tests are what the name implies. They are tests designed to produce in 45 minutes the amount of color loss which normally would be developed by five consecutive commercial or home launderings. It is evident that, in order to accomplish such a result, the test method must be more severe in certain characteristics than the washing method to which it is related. This is the basic reason why the temperatures applied in the II A and the III A test are in excess of those occurring in laundering and for the amount of bleach used in the IV A test.

The important thing to note with respect to these tests is that they will predict the color loss which will result from five average commercial or home launderings. This relationship which was built into the test has been amply proved by the results obtained in different laboratories in the period since it was developed.

After the accelerated tests had been developed and incorporated into the *AATCC Technical Manual,* the question arose as to whether the use of synthetic detergents or fluorescent dyes in the washing process would produce appreciable errors in the test results. These factors were investigated by the Washfastness Committee and found to have a negligible effect on the test result.

The 36 series tests have been used for many years in the measurement of staining. These tests are listed in *1957 Technical Manual* as "Wash Test for Characterization of Textile Colorants" and are no longer considered to be end-use tests.

This raised the question as to whether staining should be evaluated by the 36 test and color washdown by the 61 test. Extensive work carried out with relation to this problem has indicated that there is no appreciable difference in the amount of staining produced by the two types of tests in spite of the considerable differences in the test procedures and the 61-1957 test will therefore give the required information with regard to both washfastness and staining.

The 61-57 test as originally published in the *1951 Technical Manual* did not provide an adequate method of rating the amount of color loss. Various methods of determining small color differences were investigated, and in 1954 the International Grey Scale was introduced into the method for rating the amount of color loss and has proved to be very satisfactory.

The accelerated tests cover only the ordinary range of textiles in consumer use and are not intended nor are they adequate to predict the colorfastness of work clothing fabrics when subjected to industrial use and to the methods employed by industrial laundries. The washing procedures employed are characterized by high alkalinities, low soap usage and temperatures of 180°F or over. No bleach is employed in these formulas, but even so they provide a severe test for even the best vat-dyed fabrics.

The procedure for developing a test method for evaluating the colorfastness of such fabrics was essentially the same as in the case of the Standard Test 61-1957. In this work, three series of washings were carried out in industrial laundries and the washed fabrics were used as reference standards by the AATCC research staff in developing a test procedure which would predict the color loss to be expected from five industrial launderings. The development of the new Tentative Test Method 87-1958 is described in the October 6, 1958 issue of *American Dyestuff Reporter,* and it is interesting to note that the main cause of color removal by industrial laundering was wet abrasion, which is duplicated in the test method by the use of the Accelerotor. This new test method should prove an important tool, not only for measuring the colorfastness of fabrics to industrial laundering, but in the development of new dyeing methods or fabric finishes which will give increased washfastness to such fabrics.

The American Standards L22 and L24 provide for a "hand-washable" category. From a colorfastness standpoint, such fabrics are presumably textiles which would fail the II A test and yet would not show excessive loss of color when washed by hand. Work designed to set up a method of measuring washfastness at this level was carried out at the time when the present "A" Tests were developed, but the results indicated that fabrics which showed good fastness to hand washing also gave favorable results with the II A test. However, in view of the inclusion of a "hand-wash" category in the American standards, it is the duty of the Committee to reinvestigate test methods for this level of washability and to this end an effort is being made now to locate fabrics which are not machine-wash-

able and yet can be washed satisfactorily by hand.

The AATCC takes a very active part in the development of ISO test procedures, and in the field of washfastness the AATCC Research Laboratories are currently making tests on a series of samples using the test methods of AATCC and the Society of Dyers and Colourists.

AATCC test procedures should and must reflect current industrial and consumer use conditions and any of you who have problems in the measurement of washfastness which are not covered by the present test methods are urged to bring them to the attention of the Committee.

Research Developments Committee on Wash and Wear

GRAHAM M RICHARDSON

I WILL present a progress report this morning on the work of the Committee on Wash and Wear. The organizational meeting of the Committee was held on September 23, 1955 during the annual AATCC Convention in Atlantic City. The Committee decided that a test method should be set up to evaluate wash-and-wear properties in order that the term "wash-and-wear" might have uniform meaning in the industry.

For over three years, the Committee has been actively engaged in developing a method to measure the appearance and freedom from wrinkling of textile fabrics after washing and drying. Considerable study has been made of the influence of such factors as laundry temperature, type of mechanical action in laundering, size of the load in home washing, laundering time, rate of spin, method of drying and so forth on the wrinkling of various types of fabrics.

The tentative test method #88-1958 was approved by the Technical Committee on Research and published in the August 25 issue of *American Dyestuff Reporter*. The test method was developed for the express purpose of enabling one laboratory to compare on the same basis the results of their test, with those of another laboratory. It does not attempt to establish standards of acceptability, since this is not within the scope of the Association's activities. This method measures only the appearance of fabrics after home laundering, which is the most important factor insofar as wash and wear is concerned and is one which has received the greatest attention from the Committee. The use of low-angle lighting in viewing the specimens to be measured against the graded photographs permits the viewer to distinguish between small differences in the distortion of the sample.

Because of the degree of severity of lighting, color or pattern has little effect on the ultimate lighting. The Committee considered this to be highly important in the establishment of a research tool which would permit fine distinctions to be made between resin formulations on various types of fabric constructions.

Before publication of the test method, numerous interlaboratory tests were conducted, the last series of which involved nine laboratories. An evaluation of the results showed correlation which the Committee felt was excellent. Future work of the Committee calls for a study and review of the present method as well as the development of tests to cover other essential factors in wash-and-wear evaluation. Primary among these is a method for determining seam puckering.

It is the Committee's intention to keep our method abreast of the best-known technology. This will involve continual improvements in washing and drying techniques and viewing conditions. Our efforts cannot be static — we must extend and improve the methods as they are presently constituted. The rapid growth of the wash-and-wear concept makes it extremely important that we be alert to fundamental changes in areas that might obsolete the test method.

Up to now I have talked in general terms about what has been done and what is planned. Now let's be more specific.

Fortunately, the Committee was able to develop methods that give a very wide range insofar as measuring the smooth appearance of fabrics after home laundering is concerned. Through the use of five comparative photographs ranging from number 1 (not very smooth) to number 5 (very smooth), a wide range in fabric smoothness is represented.

This spread is further supplemented by the Committee's choice of four washing procedures, each representing a different level of severity insofar as its propensity to produce wrinkles in fabrics is concerned. These tests are:

1) Hand Wash — Drip Dry
2) Machine Wash — Drip Dry
3) Machine Wash — Tumble Dry
4) Machine Wash — Line Dry

With the objective of giving the tests still further capacity to differentiate fabric smoothness after home laundering, the above tests are conducted at 105°F, but tests 2, 3 and 4 have a Part A, which calls for running the washing process at 140°F. These three factors, namely, five comparative photographs, four washing procedures and two washing temperatures, adapt the test methods to use on fabrics showing the widest conceivable performance spread.

The Committee has not long debated the obvious problems associated with an attempt to define home-laundry procedures in terms of what is "normal" for the "average" housewife. However, we have chosen procedures that present a spread in what the so-called "normal" and "average" might represent.

Our procedures are for fabric only and require a dark room. The fabric swatch is observed in low-angle light while lying on a table. There is a desire on the part of some members of the Committee to avoid the use of the dark room and get a lighting procedure that can be used in an ordinary room. A subcommittee of the Committee on Wash and Wear is studying a set-up involving overhead fluorescent lighting under controlled conditions, viewing the sample at a slight angle from the vertical at eye level while the viewer stands at a specified distance from the sample. This procedure could also be adopted to garments that could be placed in the same location on a hanger. Up to

now, our objective has been to develop a method suitable for fabric. However, the usefulness of the method would be extended if it could be adapted to garments, and by so doing we could serve a broader segment of the textile industry.

When one considers changing the lighting system for a method, he must at the same time bring forward comparative photographs that were made under similar lighting conditions. This same subcommittee mentioned above has a very fine set of photographs that can be used immediately if their inter-laboratory checks show that the method has real merit.

Future consideration will be given to testing garments and the development of procedures suitable for this purpose. When the Committee next meets, this subject will be discussed. However, we are already very close to having methods that would be quite useful to persons interested in garment performance. For instance, the 15" x 15" test specimen presently used could be adapted for use by washing a fabric of similar size containing a seam, a pleat or a crease in the procedures 1, 2, 3 or 4. Photographic comparisons would be required and one of the Committee members has already come forward with a suggested group of five photographs ranging from good to bad.

We mention these things in order to take you behind the scenes, so to speak, of the Committee on Wash and Wear. We want you to know that we are carrying out the assignment given to us by TCR to develop suitable procedures in this important area of the textile business.

In closing, I would like to report that this Committee is the finest, most cooperative one that I have ever served on. On behalf of Chairman George S Wham, I would like to publicly thank all of the participants for their wholehearted help in carrying out our assignment. I would also like to thank the following organizations which have generously given of their personnel and resources:

American Home Laundry Manufacturer's Assoc
American Viscose Corp
The Apponaug Co
Joseph Bancroft & Sons, Inc
Bradford Dyeing Assoc
Carnegie Institute of Technology
Celanese Corp of America
The Chemstrand Corp
Cluett, Peabody & Co, Inc
Cone Mills, Inc
Cranston Print Works Co
Dow Chemical Co
E I duPont de Nemours & Co, Inc
Eastman Chemical Products, Inc
D B Fuller & Co, Inc
Good Housekeeping Institute
Industrial By-Products Research Co
Man-Made Fiber Producers Assoc
Monsanto Chemical Co
National Cotton Council of America
Owens-Corning Fiberglas Corp
Parents Magazine
J C Penney Co, Inc
QM Research and Development Command
Rohm & Haas Co
Sayles Finishing Plants, Inc
Scoville Manufacturing Co
Sears, Roebuck & Co
Springs Mills, Inc
J P Stevens & Co, Inc
U S Dept of Agriculture
U S Testing Co, Inc

Research Developments
Committee on Dimensional Changes in Textile Fibers

EDWARD ARTIM
Secretary

A FEW years ago it became apparent that AATCC test methods for determining dimensional changes in textile fabrics were inadequate for the needs of the fast-changing textile industry. New fibers, new fabric blends, and new chemical finishes occurred so frequently that the one existing AATCC Tentative Test Method 40-52, "Dimensional Changes in Textiles Other Than Cotton and Linen" was of very little use.

The Committee on Dimensional Changes in Textile Fabrics approached the problem from the point of view of determining practical levels of cleanability used by a consumer regardless of fiber content, fiber construction, or fabric finish. AATCC Tentative Test Method 91-1958, "Dimensional Changes in Woven Textiles (Excluding Wool)" was developed and accepted for publication in the *AATCC Technical Manual*. This method establishes four procedures varying from very mild to very severe conditions of washing which are used commonly in the commercial laundry and home. The complete test method appears in the October 20, 1958 issue of *American Dyestuff Reporter*, Vol 47, No. 21, P731—P732.

Fabric specimens are washed in a cylindrical reversing wash wheel, using one of several procedures which differ in temperature and time of agitation, after which they are extracted and pressed dry on a flat bed press.

Test Number I has a total running time of 30 minutes, which includes 15 minutes of sudsing time and two rinses at a temperature of 100°F to 109°F. The machine is stopped between each cycle for draining and refilling.

Test Number II has a total running time of 45 minutes, which includes a 30-minute suds cycle at 120°F to 129°F with two rinses at a temperature of 100°F to 109°F. The machine is operated continuously from the start of the test.

Test Number III has a total running time of 60 minutes, which includes a 40-minute suds cycle at 160°F to 169°F, two rinses at a temperature of 100°F to 109°F, and a wet-tumbling cycle. The machine is operated continuously from the start of the test.

Test Number IV has a total running time of 60 minutes, which includes a 40-minute suds cycle at 203°F to 212°F, two rinses at a temperature of 140°F to 149°F, and a wet-tumbling cycle. The machine is operated continuously from the start of the test.

Test Number I is identical to Tentative Test Method 40-1957, "Dimensional Changes in Textiles Other Than Wool (mild action, low temperature conditions equivalent to hand washing)." Test Number IV is

identical to Standard Test Method 14-1953, "Dimensional Changes in Cotton and Linen Textiles" which was intended for determining shrinkages of woven cotton, linen and mixed cotton and linen fabrics to the most rigorous commercial or home laundering. Tests Number II and III fill in the large gap which existed between the existing very-mild and very-severe washing procedures.

The Committee on Dimensional Changes in Textile Fabrics prepared a research report entitled "Laundering Procedures in the Commercial Laundry and in the Home", which was published in *American Dyestuff Reporter*, Vol 47, No. 6, March 24, 1958, P187—P190. This information was the basis for developing the additional wash test Numbers II and III, and will be useful in the planned future work of the Committee.

Three subcommittees are working concurrently on the following projects.

DIMENSIONAL RESTORABILITY PROJECT —— Dimensional restorability has been defined by the Committee as the maximum amount of stable change that can be induced by stretching or wearing a fabric measured on the basis of that fabric when washed and flat-bed pressed. The Committee hopes to develop a test method for determining the dimensional restorability (as defined) of textile fabrics which can be used in conjunction with the Tentative Test Method 91-1958 for determining dimensional changes to give the net change in dimensions. Certain woven fabrics react as most knitted fabrics in that they have very high shrinkage values after washing. Subsequent ironing or wearing recovers most of this shrinkage. Five fabrics with known shrinkage and restorability characteristics are being used in developing the test for dimensional restorability. These two tests will then reflect the dimensional change in end use for those textile fabrics which show high shrinkage values after laundering and flat-bed pressing, but are known to give satisfactory consumer serviceability because of the dimensional restoration which occurs by pressing or ironing procedures used in the home or laundry.

In 1956, the Technical Committee on Research authorized an AATCC Research Headquarters Project to develop a test method for determining dimensional restorability as defined by the Committee.

A subcommittee has worked independently of this project and recently has submitted interlaboratory data using the Tension Presser, which shows fairly good correlation between laboratories. It is likely that a tentative test method for determining dimensional restorability will be available in the near future as a result of the work of this subcommittee.

DIMENSIONAL CHANGES OF KNITTED FABRICS —— AATCC has a test, "Relaxation and Felting Shrinkage of Wool Knit Fabrics, Tentative Test 74-53," but other than this there is no test method applicable to knitted fabrics. A subcommittee is working to develop a test method which will satisfy this very important need. Special study is concentrated on the possibility of adopting the Tentative Method of Test for Dimensional Changes of Knit Fabrics, ASTM Designation: D1470-57T.

DIMENSIONAL CHANGES TO DRYCLEANING —— A subcommittee reports it is nearing completion of a test method for determination of dimensional changes of fabrics under varying conditions of drying. The Committee's research report states that drying procedures in the home may be tumble drying, line drying, or drip drying. Experience shows that the various drying methods can give significantly different shrinkage results. In many instances, the varying temperatures and times of washing agitation show little difference in shrinkage results as measured after flat-bed pressing to dryness, but wide variations in shrinkage are produced by other methods of drying, such as tumbling to dryness.

It appears possible that the AATCC Committee on Dimensional Changes may have, within the not too distant future, test methods for determining dimensional change and dimensional restorability characteristics of all fabrics, regardless of fiber content, fabric construction, fabric finish, or regardless of the method of drycleaning, washing, drying or finishing to which the fabrics are subjected in the course of normal drycleaning or home washing or commercial laundering.

AATCC Calendar

COUNCIL, COUNCIL COMMITTEES, RESEARCH COMMITTEES

Jan 28-30 (Hotel McAlpin, New York, NY)
Jan 28—Research Committees
Jan 29—Council Committees, TCR, ECR
Jan 30 (AM)—Council Meeting

May 29, 1959 (Mount Royal Hotel, Montreal, Canada)

NATIONAL CONVENTIONS

Oct 8-10, 1959 (Sheraton Park and Shoreham Hotels, Washington, DC); Oct 6-8, 1960 (Sheraton Hotel, Philadelphia, Pa.); September 28-30, 1961 (Buffalo, NY); 1962 (Southern Region)

HUDSON-MOHAWK SECTION

Jan 16 (Jack's Restaurant, Albany, NY); Mar 27 (Chelsea House, Tribes Hill, NY), May 15 (Ladies night, Albany area); June 26 (Annual outing—Antlers Country Club, Tribes Hill, NY)

MID-WEST SECTION

Feb 14 (Bismarck Hotel, Chicago, Ill); May 2 (Schroeder Hotel, Milwaukee, Wis); June 12-13 (Outing—Brown Lake Resort, Burlington, Wis)

NIAGARA FRONTIER SECTION

Feb 20 (Niagara Falls, Ont); April 4 (Hamilton, Ont—joint meeting with CATCC)

NORTHERN NEW ENGLAND SECTION

Jan 16 (Colonial Club, Lynnfield, Mass)

PIEDMONT SECTION

Jan 24 (Poinsett Hotel, Greenville, SC); April 10-11 (Robert E Lee Hotel, Winston-Salem, NC); June 5-7 (Outing—Grove Park Inn, Asheville, NC); Sept 25-26 (Barringer Hotel, Charlotte, NC)

SOUTH CENTRAL SECTION

Mar 21, Sept 19 (Hotel Patten, Chattanooga, Tenn); June 26-27 (Outing—Riverside Hotel, Gatlinburg, Tenn)

WESTERN NEW ENGLAND SECTION

Jan 23, Mar 6, Apr 17, May 15, June 12, Sept 25, Oct 23, Dec 4

Research Symposium Luncheon———

The Importance of AATCC to the Textile Industry and the Consumer*

GEORGE H JOHNSON
Vice President
American Institute of Laundering

TODAY'S activities, closing with this luncheon, summarizes one of the most important functions of AATCC, namely committee work in setting up testing procedures.

Some people think of committee activity as a waste of time and sometimes, but not necessarily, it is. This point is illustrated by a story told about Charles Kettering, who was busy in his office one day in May of 1927 when Lindbergh flew successfully across the Atlantic and landed in Paris. An assistant rushed into Mr Kettering's office with the exciting news. He was definitely not impressed. The assistant repeated the news. Still unimpressed, Mr Kettering said, "Let me know when he does it with a committee." However, all of us know that this is an exaggeration.

Before we go any further, let us review the objectives of AATCC as shown by Article II of the Association's Constitution:

"The objects of this Association shall be:

"To promote an increase of knowledge of the application of dyes and chemicals in the Textile Industry.

"To encourage in any practical way research work on chemical processes and materials of importance to the Textile Industry.

"To establish for the members channels by which the interchange of professional knowledge among them may be increased."

The Bylaws of AATCC further provide for the appointment of a number of technical committees, including an Executive Committee on Research and a Technical Committee on Research. The Executive Committee on Research "shall be responsible for the general research policy and program of the Association."

Among other things, the Technical Committee on Research, unless otherwise specified by the Executive Committee, "shall be responsible for contact with other committees of the Association on technical matters and for coordinating all cooperative research with outside organizations."

A BASIC FACT APPLICABLE TO ALL OF US———I believe everybody here today is motivated by at least one common urge, and that is our economic and physical survival. We all want to continue to live. To do so comfortably, we all must make our living. Some of us live by converting textile fibers into salable fabrics, which when cut and tailored into wearing apparel or into flatwork, such as sheets, towels and what not, we hope will appeal to the consumer, who will buy them. And so the converter; the textile chemist, dyer, printer and finisher; the cutter; the wholesaler, and finally, the retailer, all rely upon textiles in order to make a living. After the retailer sells to the consumer, she uses these textiles and then sends her soiled work to the drycleaner or the laundryowner so that these items may be reused, or else she cleans them herself. Tied into this picture at the very beginning is the dyestuff and chemical manufacturer, who provides the great textile industry with necessary processing supplies.

So, at the very end, all of us come slap up against one very hard fact—Mrs Consumer. If we are to *continue* to make our living, we of necessity must produce, sell, and service textiles in such a way that our boss, Mrs Consumer, comes back to us for additional purchases and services of textiles forever and ever. Amen.

Now what does this have to do with the development of standard methods of testing for textile laboratories? Basically it has a lot to do with it. Let me illustrate.

From a consumer point of view, at least in staple items, if a certain brand of sheets has given a housewife satisfactory service and she again is in the market, the odds are that she will buy merchandise bearing the same brand name for the same purpose. This means that the retailer must have a suitable stock of merchandise on hand. Obviously, the smart mill itself will avoid unnecessary changes in its product if it is successful, except for improvements, and will maintain quality. The sheeting manufacturer can do this by having his plant laboratory check his sheetings against previous production for such common properties as size, thread count, percentage of sizing, tensile strength, tear strength, and, if colored sheets, colorfastness to repeated laundering, light exposure, crocking, perspiration and etc. Likewise, he can compare the quality of his output with that of his competitors. In turn they can—and do—keep a close check on him.

From this illustration we see how important it is that *standard methods* of test be used, so that the results obtained are comparable and reproducible. AATCC has given leadership through its various committees and subcommittees to producing such standard test procedures and then has made them available for all to see and use. By doing so, AATCC has done the public a real service.

AATCC TEST METHODS AND THE LABORATORY———Probably the best way to illustrate how a laboratory uses AATCC test methods for its own purposes would be to discuss an actual situation.

For some months now, we have seen how cotton has been fighting to retain its market in competition with chemical-fiber blends. The situation came to a climax in the fall of 1957 when practically every leading shirt manufacturer announced the drip-dry cotton dress shirt, and retailers began to push them locally. And speaking of wash-and-wear, I wonder how many of you saw this item in *America's Textile Reporter*?

"One of our readers, having digested *Good Housekeeping's* speci-

*Presented by Mr Johnson, guest speaker, at the Technical Committee on Research Luncheon, which was held at the conclusion of the TCR-sponsored symposium "AATCC Research at Work", November 1, 1958.

al section of wash and wear in its May issue writes:

'It leaves me somewhat confused. One might observe, if facetiously, that it might be wisdom for the housewife, who wishes to successfully cope with the developments in Wash-and-Wear techniques, to:

Get a B S degree at MIT.

Take a P G course in chemistry at Rensselaer Polytechnic Inst. A course in heat engineering at Cornell might be helpful. She should be completely familiar with fibers, weaves, constructions, so a course at Lowell Tech would be in order. And most important, never approach her washing machine without being equipped with a slide rule, a test tube, a barometer, a thermometer, and a calm, hopeful disposition.'"

Naturally, we in the laundry industry have watched this new trend in dress shirts with considerable interest. What would be the effect of this new type of shirt upon our business? Would the profitable item of shirt laundering be seriously diminished in volume? Would our bundles become smaller? Or would people stop sending dress shirts to our laundries?

Over a period of time, we have learned that, even though Mrs Housewife may buy drip-dry dress shirts for her husband, nevertheless, if he has been a customer of a professional laundry before, in many cases he still sends the shirts to our plants to be laundered. While some men are satisfied with drip-drying their shirts, many others, more fastidious perhaps, object to wrinkled cotton seams observed with some brands. They prefer a well-finished shirt. Although statistics obviously are lacking at this early date, it is safe to say that, in spite of all the publicity given to drip-drying, a sizable proportion of dress shirts is being finished today in our laundries. Certain shirt manufacturers have gone so far as to express the belief that the drip-dry shirt has the greatest appeal to the user of home washing methods, where the housewife dislikes ironing her husband's shirts.

Investigation under commercial laundry conditions further show, that there are varying grades and qualities of such merchandise, some good and some bad. The following problems have developed with some types of cotton wash-and-wear shirts:

1) Discoloration, chiefly yellowing of the resin finish.
2) Shirts are not always properly cleaned by the drip-dry laundering methods suggested; collars and cuffs require special handling.
3) Seam puckering is objectionable to many.
4) Odor problems have been observed with some items, generally formaldehyde or amine in nature.
5) Loss of wrinkle-recovery properties may occur with repeated laundering.
6) And chiefly, it has been clearly demonstrated that urea-formaldehyde resins, if bleached with hypochlorite at home or in the laundry, often fall apart when pressed to complete dryness, due to the formation of hydrochloric acid.

With this information at hand our laboratories decided that we should warn the various branches of the textile industry concerned about the dangers of using UF resins on white cottons, in spite of their relative cheapness, compared to the acetal, epoxy, and triazone types. We have done this with some success.

Now again, where does AATCC and its technical committees fit into this picture? They fit very closely because our laboratories then went one step further. After considerable trial and error, our technicians decided on standards of performance, which still are under study. These standards are based largely on AATCC and ASTM testing methods. Why? Because the test methods adopted are generally accepted by textile laboratories throughout the United States and are reproducible.

RESEARCH ACTIVITIES OF AATCC —— It is obvious that AATCC also provides its membership with a clearing house for collecting and disseminating information concerning new textile and chemical developments. Sectional and national meetings, such as the one we have been attending this week, provide us with an open forum where the problems of the day may be discussed. Furthermore, the pages of the *American Dyestuff Reporter* provide us with timely information concerning new problems, discoveries, and new dyestuffs and other textile products.

It seems to me also that AATCC was very wise in establishing a National Headquarters at Lowell Technological Institute with George P Paine as executive secretary and Harold W Stiegler as director of research. There has to be some one point at which all activities of an organization must be centered and from which valuable data, including standard methods of tests, may be distributed.

Such a headquarters also provides an opportunity for a well-trained, full-time staff to devote its efforts to assisting the various technical committees and subcommittees in their assignments. Further, it provides AATCC with the opportunity to conduct research in such areas, perhaps as are somewhat beyond the scope of committee operations. The development of the Accelerotor is an illustration of a type of AATCC activity that requires close laboratory supervision, as a testing device is perfected for industry use. We in the laundry industry are delighted that the effect of friction on soil removal and color retention is being recognized by the various laboratories. Our experience throughout the years has clearly demonstrated that color loss during washing does not depend entirely on detergent concentration, pH, and temperature alone. Frictional action is also important.

The importance of research and committee work cannot be overemphasized. The relatively recent AATCC work on lightfastness is a case in point. Out of comparative studies made in such areas as Arizona and Florida, the following facts, previously suspected, were verified. These factors included the effect of:

1) Humidity
2) Varying intensities of daylight and sunlight
3) Atmospheric conditions
4) Time of day and length of exposure.

The AATCC Committee on Colorfastness to Light, after a careful study, came to the conclusion that time of exposure was not the answer, but that evaluation should be based on the total energy received by exposed samples, regardless of where the colored materials are exposed. By using langley units of energy, a technician may give his results in the common language of energy received by the exposed specimen. Greater accuracy in testing for colorfastness to light is the result.

In conclusion, other examples of excellent work of the several AATCC Committees could be used to illustrate the importance of this activity not only to us as technical people, but also to the general public itself. I am certain that if, by some miracle, Louis A Olney, my old professor at Lowell, today could see how his idea of creating such a technical society as AATCC has grown, prospered, and become strong and effective, he would be pleased with what he saw.

A MESSAGE FROM THE NEW PRESIDENT

CONSIDERABLE criticism has been directed in the past by local sections and regions concerning poor distribution of representation on national committees and policies. With this in mind, it is necessary that the local sections keep me informed, not only of members who can and will work actively on our committees, but also of any other problems or constructive criticism of the administration.

We have to take a fresh look at everything connected with our objectives. Many procedures were satisfactory with a membership of one or two thousand located principally in four or five states, but with the size and location of our present membership, along with a relocation of interests, it may be advisable to review our activities and procedures in order to keep a virile and active membership that will attract support and appreciation of the Textile Industry.

It has been my experience that a group, working as a team, can produce better results than any individual. I am therefore depending on every Section of our Association to keep us well informed as to the pulse "at home."

In the interest of putting more vim and vigor into our activities, please send me as much information and/or criticism as you can, and at the same time keep your regional vice president well advised. It is my intention to meet with our officers prior to each Council meeting to evaluate what we have accomplished and review our future goals.

Please realize that we will scrutinize every recommendation received, but it may be impossible, for obvious reasons, to answer every letter. We expect that our actions will show that we are attempting to operate as the majority of the membership desires.

W G HELMUS
President

PLANS UNDERWAY FOR '59 CONVENTION

PLANS for the 1959 National Convention, to be held at the Park-Sheraton Hotel in Washington, DC, October 7-10, are well under way. Committee chairmen have been appointed by Leonard Smith, Convention Chairman, and Nelson F Getchell, Deputy Chairman, both connected with the National Cotton Council of America, Washington, DC.

Preliminary plans were outlined in a meeting of all committee chairmen at the Organizational Meeting held at the Park-Sheraton on December 5.

Members of the Association will be kept informed regarding the technical and social program in the future editions of *American Dyestuff Reporter*, but it is not too early to start making your plans for attending what is expected to be the largest National Meeting of the AATCC ever to be held.

Washington, DC, has been selected as the Convention City for several reasons:

1) It is centrally located between the North and South.
2) It is readily accessible by plane, train, driving or other means of transportation.
3) Adequate hotel facilities are available for room and exhibit space.
4) A wealth of historical and cultural interest is abundant.

Photo taken during a recess in the December 5th organizational meeting for the 1959 AATCC Convention shows:

Seated, l to r: Esther Batchelder, chairman, Ladies Committee; George P Paine, executive secretary, AATCC; Geo O Linberg, president, AATCC; Leonard Smith, 1959 Convention chairman; Nelson F Getchell, deputy chairman.

Standing, l to r: R E Rettew, representing the chairman of the Piedmont Section; Arnold Sookne, chairman, Technical Program Committee; Ralph W Carr, chairman, Reception Committee; J R Wiebush, chairman, Hotel Committee; Louis Mizell, chairman, Finance Committee; George Fulton, chairman, Exhibits Committee; George Lourigan, chairman, Transportation Committee; Robert Graham, chairman, Registration Committee; John Cook, chairman, Printing Committee; E Oliva, chairman, Tours Committee; and A R Thompson, chairman, Publicity Committee.

Your enjoyment of the 1959 Convention will be amply provided for from the preregistration, reception, and throughout your stay in Washington. You will hear from each of the Convention chairmen in later issues of the *Reporter*, wherein they will outline their plans in detail.

No official motto has been adopted as yet for the 1959 National Convention, but you can be assured of a profitable, informative, and good time in 1959.

A R THOMPSON
Convention Publicity Chairman

Membership Applications

SENIOR

William A Bours III—Director of sales, Dyes & Chemicals Div, E I duPont de Nemours & Co, Inc, Wilmington, Del. Sponsors: D C Newman, C A Sylvester. (DV).

Herbert C Bridges—Dyer, Clarksville Finishing Plant, Pacific Mills, Clarksville, Va. Sponsors: C F Schilkowsky, D A Qualls Jr. (P).

Clarence C Campbell—Mgr, Textile Chemicals Lab, Pennsylvania Industrial Chemical Corp, Clairton, Pa. Sponsors: G A Heath, W C Caldwell. (DV).

Charles P Crute Jr—Shift dyer, Clarksville Finishing Plant, Pacific Mills, Clarksville, Va. Sponsors: C F Schilkowsky, D A Qualls Jr. (W).

J Robert Cullen—Chemist, Shell Chemical Corp, New York, NY. Sponsors: H A Rutherford, K S Campbell. (P).

John E DeKalb—Supt, finishing plant, Printed Fabrics, Carrollton, Ga. Sponsors: H G Smith, P G Carlson Jr. (S).

W Richard Fisher—Head dyer, Clarksville Finishing Div, Pacific Mills, Clarksville, Va. Sponsors: C F Schilkowsky, D A Qualls Jr. (P).

Jack Gutierrez—Concord Dyeing & Finishing Co, Bronx, NY. Sponsors: L R Hamilton, A W Visocki. (M).

David G Holland—District mgr, General Chemical Div, Allied Chemical Corp, Atlanta, Ga. Sponsors: J C Cook, G H Dockray. (S).

Robert O Hope—Lab tech, Blackman Uhler Co, Spartanburg, SC. Sponsors: D W Belcher, J E Woody. (P).

Melvin H Hudson—Supt of dyeing, Greenville Mills, Inc, Greenville, NC. Sponsors: C T Worthen, F P Mackinney. (S).

Howard W Kulp—Head dyer, Snow White Bleachery, Royersford, Pa. Sponsors: L K McChesney, W S Sollenberger. (DV).

Claude M Lee—Supv, technical service, textile fibers, E I duPont de Nemours & Co, Inc, Wilmington, Del. Sponsors: S W Brainard, C A Sylvester. (DV).

Clarence L Michaud—Chief chemist, Concord Dyeing & Finishing Co, Portchester, NY. Sponsors: L R Hamilton, A W Viscocki. (M).

Joseph R Myers — Southeastern States sales mgr, Hubinger Co, Keokuk, Ia. Sponsors: A K Haynes, A W Picken. (S).

Edward C Oliva—Senior chemist, Harris Research Labs, Inc, Washington, DC. Sponsors: A M Sookne, L R Mizell. (W).

Ernesto Pantaleoni—Chief chemist, Lanerossi SPA. Sponsors: O M Lea, C H McLaughlin.

James R Retter—District sales mgr, Union Carbide Chemicals Co, Needham Heights, Mass. Sponsors: K H Barnard, H E Glidden. (NNE).

L Monroe Whitt—Purchasing agent, Cone Mills Corp, Greensboro, NC. Sponsors: M J Gardner, W E Rixon. (P).

JUNIOR

Richard Chwatt—Chief chemist-dyer, Chwatt Bros, Inc, Brooklyn, NY. Sponsors: A J Rooney, H Chwatt. (M).

E Theodore Colcolough—Trainee, Union Bleachery, Greenville, SC. Sponsors: E G Jones, H C Hurt. (P).

Harry A Freedman—Textile engr, Malden Ltd, Lawrence, Mass. Sponsors: D Frishman, J P Ploubides. (NNE).

Franklin C Hoak—Chemist, National Inst of Drycleaning, Silver Spring, Md. Sponsors: R T Graham, J R Wiebush. (W).

Ersel O Jones—Finishing foreman, Collins & Aikman Corp, Cavel, NC. Sponsors: L C Frederick, C M Keenan. (P).

Arthur Nedvin—Esso Research & Engineering Co, Enjay Laboratories, Linden, NJ. Sponsors: C A Cohen, H E Glidden. (Met).

CORRECTION

Re: 1958 Technical Manual

YOUR attention is called to an error on page 533 of the 1958 Technical Manual under the Alphabetical List of Members.

The business address of Rudolph Zwicky should read as follows:

Pres & Mgr, Helam Chem Co, Inc, Box 708, Sycamore, Ill.

Colorist & Chem, American Art Clay Co, Indianapolis, Ind.

Lewis J Turner Jr—Chief chemist Tchitsazi-Tehran, Div of United International, Tehran, Iran. Sponsors: W F Thompson, J Dabrowski.

ASSOCIATE

Aldo fu A Fumagalli—Mgr, Dalton spa Viale Padova 282, Milan, Italy.

John R Jacobucci—Sales mgr, alkali chemicals, Westvaco Chlor-Alkali Div, Food Machinery & Chemical Corp, New York, NY. (M).

Dale J Milnes—President, Ozone Research & Equipment Corp, Phoenix, Ariz. (PS).

P Manson Mullikin—Sales, Van Waters & Rogers, Inc, Portland, Ore. (PN).

Victor B Sarkissian — Philadelphia district mgr, Electrochemicals Dept, E I duPont de Nemours & Co, Inc, Wynnewood, Pa. (DV).

STUDENT

Roberto Facusse and **Cecil K Nelson** —Students, Georgia Inst of Technology, Atlanta, Ga. (G).

TRANSFER—JUNIOR TO SENIOR

J Robert Wagner—Research engr, F C Huyck & Sons, Rensselaer, NY. Sponsors: D R Christie, R H Beaumont. (HM).

TRANSFER—ASSOCIATE TO SENIOR

James T Lindley—Southern sales mgr, W F Fancourt Co, Philadelphia, Pa. Sponsors: J L Fancourt, R P Rhodes. (M).

Richard E Mackey—Chemical engr, Mohasco Industries, Inc, Amsterdam, NY. Sponsors: F J Szurek, H C Thompson. (HM).

Harold B Peterson—Chemical sales, Virginia Smelting Co, Atlanta, Ga. Sponsors: L L Bamberger, J D Mosheim. (S).

TRANSFER—STUDENT TO SENIOR

R George Zaloom—Lab tech, Texstyle Corp, Clifton, NJ. Sponsors: S Munroe, S B Secco. (M).

Elected to Membership

November 20, 1958

SENIOR

Robert F Bann
Edward A Brophy
Louis J Campana
Frank N Fortuna
Jewel Golden
Harold P Lundgren
Friedrich C Schneider
Walter J Turner
Jack B Williamson

ASSOCIATE

Fred C Hoehn
Thomas N Huggins
Jorge C Lopes
Carl R Johnson
Jack J Thigpen

JUNIOR

Harry D Biehl
James E Lonon Jr
Floyd H Simpson
Calvin Taylor

STUDENT

Richard C Freeman
Toby R Koffman
John M Peret

December 17, 1958

SENIOR

Joseph A Charlton
Paul L Calloway
Edward C Dorton
Paul G Dyson
Frank S Fayssoux
L R Graybeal
Donald Hartas
Wendell C Hildenstein
Joseph L Huckabee
Ferdynand Huttner
Joseph Lowe
John E McMurray
Richard W Meuse
Louise Peach
Homer L Robson
John S Robinson
Frank J Rogan
Thomas L Rusk Jr
Albert Thomas
Richard I Tucker
Leon P Urdang
George I Walker
Richard F Wirth

ASSOCIATE

Arthur E Menke

JUNIOR

Stanley B Berman
Arthur R Brinson
Donald Wm Denman
Ivan H Gordon
U Hia Kyl
Arvind K Mody

STUDENT

Leonard G Alves
Sidney L Barkoff
Cornelius Cahill
Lawrence J Canavan
Albert A Duggan
Alfred J Furtado
Eric M Golden
William E Graham
Florence B Habib
Kenneth M Harms
Harold M Hersh
Barry L Hooks
Joseph L Hutchison
Adeline Lim Hwang
Dayne S Johnson
Thomas N Kiernan
Russell S Kingsmore
John J Klocko
James I C Lang
James H Lewis
Ronald R Luongo
Michael J Matheke
Alfred I McNally Jr
John J Mitnitsky
Vinodchandra K Mody
Sayer N Needelman
Elizabeth Ong
Chandulal C Parikh
Bernadette V Petrauskas
Oscar L Scarbrough
Arthur R Slimone
Prisco L Villa
Chester J Zukowski

January 1, 1959

SENIOR

Olaf T Akerberg
Karl Bosshardt
Massimo Cazzaroli
Thomas E Croxson
Louis F Cocker Jr
Albert J Cunningham
Francis W Day
Rolf N Forrer
Richard S Hunter
Carl E Johnson
James M Kiefer
Lloyd Leonard
Robert B Lindstrom
Thomas D Miles
Ross C Peffal
J Kenson Simons
Robert A Sullivan
Ken Yonesu

JUNIOR

Thomas G Ellington Jr
Manuel A Mercado
Thomas S Quealy
Thomas F Rooney
Francis J Scavitto

ASSOCIATE

Dorothy Ann Bissell
Herbert P Chase
Shis K Fan
Allen C Frick
Hiram H Jackson
James G Marvin
Howard H McCall
Ernest G Tesch
Richard C Voyles
William D Weathers

STUDENT

Muriel Angelil
John Apinis
Clayton G Asbury
Mack Atkinson
Milton A Berube
William Conn
Charles E Daniels
James N Etters
Bruce A Evans
Charles Gotuaco
Troy D Grant
Robert C Hartzog
Carol M Hebert
Roger A Hinson
Elizabeth A Johnson
Wing Lee Kai
Alexander G Kepley
Russell S Kingsmore
Bobby F Mayse
Elbert S Mullis
Norman Nevins
John R Newell Jr
William M Owens
Ashok M Patel
Charles E Rickell
Gerald S Rose
Ashok A Sanghavi
James M Seago
Ralph E Sims
William C Smith
James T Swicegood
Robert Lee Ward Jr
Robert W West
Fred E Wilson
Ibrahim Yuceyar

ACTIVITIES OF THE LOCAL SECTIONS

1959 OFFICERS—NNE SECTION———Seated, l to r: Joseph S Panto, secretary; Edward J McNamara Jr, vice chairman; Robert D Robinson, chairman; William W Pennock, treasurer. Standing, l to r: Edward B Bell, national councilor; Robert J Peirent, national councilor; John J O'Neill, sectional committeeman; Gerald F Quigley, national councilor; Bennett S Gesmer, sectional committeeman. Not present when photo was taken were Herbert L Ortstein and John Ormiston, sectional committeemen.

Northern New England

ATTENDANCE exceeded 160 at the Northern New England Section's Annual Meeting, held December 5th at the Hotel Vendome, Boston, Mass, with Chairman Edward B Bell presiding.

John P Ploubides, Lowell Technological Institute, chairman of the Nominating Committee, presented a slate of officers, which the Section approved.

The new officers are: *Chairman*—Robert D Robinson, Bachmann Uxbridge Corp; *Vice chairman*—Edward J McNamara Jr, Rohm & Haas Co; *Treasurer*—William W Pennock, E I duPont de Nemours & Co, Inc; *Secretary*—Joseph S Panto, Fabric Research Laboratories, Inc. National Councilors representing the Northern New England Section for 1959 are: Edward B Bell, Textile Aniline & Chemical Co; Robert J Peirent, Lowell Technological Institute; and Gerald F Quigley, Agawam Dyeing Corp. The Sectional Committee for 1959 is comprised of John J O'Neil, Dow Corning Corp; Herbert L Ortstein, J P Stevens & Co, Inc; Bennett S Gesmer, Dyecraftsmen, Inc; and John Ormiston, Sandoz, Inc.

A rising ovation was tendered Azel W Mack on his completion of seventeen years of service to the Section as secretary.

The technical program consisted of a panel discussion entitled "Polymers in Textile Processing." Introductory remarks were presented by the following polymer scientists: Victor S Frank, Dewey & Almy Chemical Co; D Donald Gagliardi, Gagliardi Research Corp; Lloyd H Perry, UBS Chemical Co; and Herman F Mark, Polymer Research Institute. An informal discussion followed.

The meeting was acclaimed by many as one of the Section's best.

Myron J Coplan, assistant director of Fabric Research Laboratories, Inc, will be the speaker at the Section's January 16th meeting at the Colonial Country Club, Lynnfield, Mass. His subject will be "Some Aspects in Fiber Blending".

Another highlight of the January meeting will be the awarding of engraved plaques to each of the fifteen living past chairmen of the Section.

PANEL LEADERS AT NNE SECTION'S DECEMBER 5TH MEETING———L to r: D Donald Gagliardi, Lloyd H Perry, Victor S Frank, Herman F Mark

Niagara Frontier

THE Niagara Frontier Section of AATCC held its last dinner meeting of 1958 on December 5th at the Peace Bridge Motel, Buffalo, NY, with 22 members in attendance.

During the business session, the chairman of the Nominating Committee proposed the following slate of candidates for Section offices in 1959: *Chairman*—Kenneth A Lister, Canadian Industries Ltd; *Vice chairman*—Anton Viditz-Ward, Van Raalte Co; *Treasurer*—Joseph D Noonan, National Aniline Div; *Secretary*—Earl R Eakins, Monarch Knitting Co; *Councilor*—Thomas R Foltz, Lockport Felt Co. B K Easton's move for unanimous election of the above candidates was approved by the members present.

W Leyking, outgoing chairman, thanked the officers for their help during his two years in office and introduced the new chairman, Mr Lister.

The technical phase of the meeting featured a talk by R Rosenbaum, supervisor of technical service, Semet-Solvay Petrochemical Div, Allied Chemical Corp, on "The Use of Polyethylene Emulsions in Textile Applications". The talk, illustrated with slides, described emulsion preparation and the use of emulsions in nonionic, anionic and cationic systems. The results of tests on unblended material and man-made fibers showed increases in tear strength with extremely small amounts of deposited polyethylene. In blended fabrics the flex abrasion and tear strength is improved. In conjunction with thermosetting resins, the polyethylene gives higher crease resistance improvements. Polyethylene has been found to be present in the fabric after twenty launderings.

Activities of the Local Sections———

Meeting of the Southeastern Section
December 6, 1958 • Atlanta Athletic Club • Atlanta, Ga

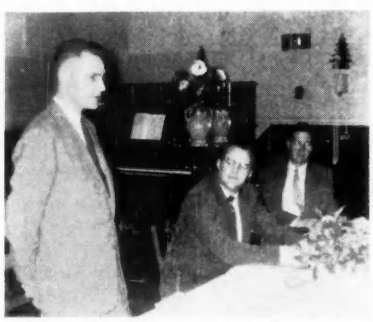
1959 OFFICERS AND COMMITTEE CHAIRMEN———Seated, l to r: Leon Tigler, Eagle & Phenix Div, Reeves Bros Inc, treasurer; Warren Tiller, Tennessee Corp, secretary; Robert B Hallowell, Coats & Clark, Inc, chairman; William Fayssoux, Royce Chemical Co, national councilor; William B Amos, Jefferson Mills, vice chairman. Standing, l to r: A Kempton Haynes, Rohm & Haas Co, custodian; Richard Stephens, E I duPont de Nemours & Co, Inc, sectional committeeman; Fred Hand, Chemstrand Corp, sectional committeeman; John C Cook, W R C Smith Publishing Co, sectional publicity chairman; Joe Richardson, Russell Mfg Co, national councilor; T Howard McCamy, Seydel-Woolley & Co, national councilor; and Cecil Ray, Pepperell Mfg Co, chairman, Research Committee

Western New England

THIRTY-FIVE members and guests were present for the December 5th meeting of the Western New England Section, which was held at Rapp's Restaurant, Shelton, Conn.

Speaker of the evening was Phillip A Gruber, Textile Development Group, Dow Chemical Co, who discussed "The Dyeing of Zefran and Zefran Blends".

The Section has decided to conduct a membership survey to determine the most suitable location for future meetings in an effort to increase the number of members attending. The survey will also include a question with regard to the type of program members would prefer.



HEAD TABLE AT DECEMBER 5TH MEETING OF WNE SECTION—L to r: Phillip A Gruber, guest speaker; Andrew W Goodwin, chairman; Timothy J Horan, secretary. Mr Gruber's topic was entitled "The Dyeing of Zefran and Zefran Blends"

WNE SECTION OFFICIALS MEET PRIOR TO DECEMBER 5TH MEETING— Seated around table (clockwise): John E Hirn Sr, national councilor; Mark Pettit, sectional committeeman; Ernest Otto, sectional committeeman; Andrew W Goodwin, chairman; Albert H Rant, vice chairman; Timothy J Horan, secretary; Paul W Reeves, sectional committeeman; John E Hirn Jr, sectional committeeman

Pacific Northwest

FIFTEEN members and two guests attended the 1958 Fall Meeting of the Pacific Northwest Section, which was held at the Aero Club, Portland, Ore, on December 19, 1958.

The following Sectional officers were elected for 1959: *Chairman*—Jack Gilberg, General Chemical Div, Allied Chemical & Dye Corp; *Vice chairman*—Paul J Pernice, Dyestuff & Chemical Div, General Aniline & Film Corp; *Secretry—Danny Gay*-man, Ciba Co, Inc; *Treasurer*—Dale W Kimsey, Geigy Dyestuffs. Serving on the Sectional Committee for 1959 are: Richard R Beaudoin, Charles E Bouthillier, and Theodore M Marshall.

✦✦

AATCC Committee on Evaluation of Desizing Agents Reorganized

THE Committee on Evaluation of Desizing Agents was recently reorganized, with Frederick J DiCarlo of the Fleischmann Laboratories, Standard Brands, Inc, having replaced Paul Seydel of Seydel-Woolley & Co as chairman. The present Committee consists of 11 members, about one-half of whom are new.

Dr DiCarlo visited Committee secretary Walter Lindsly, Rohm & Haas Co, in Philadelphia to develop a specific and immediate Committee program. At this meeting it was decided to try out a questionnaire technique to obtain information without holding meetings. This method has thus far proved successful, it is reported.

The new Committee held its first meeting October 30, 1958 at Chicago.

Members of the Committee in addition to Dr DiCarlo and Mr Lindsly are as follows:

W H Bartholomew, Pabst Laboratories
Herman Brown, Sandoz, Inc
Francis K Burr, Fabric Research Laboratories, Inc
Joseph Creely, Wallerstein Co
Paul Feldman, Dan River Mills
Edward H Grosse, A E Staley Mfg Co
John A Komninos, Waldrich Co
Joseph C Smith, Cranston Print Works Co
P J Wood, Royce Chemical Co

COLOUR INDEX NOW COMPLETE!

ALL FOUR VOLUMES
OF THE NEW

COLOUR INDEX

NOW AVAILABLE

The First Edition of the COLOUR INDEX was published in 1924 and now, thirty-four years later, the Second Edition is ready for you. You cannot afford to wait for some future edition. There is no other up-to-date index of world coloring matters.

Your prepaid subscription received promptly will insure your possession of this LIMITED EDITION, a tremendously valuable work on the free world's dyestuffs and pigments in commercial use. Published by the Society of Dyers and the Colourists (British) and the American Association of Textile Chemists and Colorists, these four volumes totaling 3152 pages provide the only complete reference of coloring matters available to those interested in this field. They include information on methods of application and fastness properties of coloring matters furnished by world manufacturers, chemical and structural information, characteristic reaction, index of products and trade names, fastness tests and rating methods, new and old COLOUR INDEX NUMBERS, Schultz and AATCC prototype numbers and a hue indication chart.

PREPAID SUBSCRIPTION FOR THE FOUR VOLUMES IS $112.00 PER SET, PACKAGED AND DELIVERED

ORDER NOW FROM:

American Association of Textile Chemists and Colorists

PO Box 28, Lowell, Massachusetts

• PATENT DIGEST •

PAUL WENGRAF

ANTISTATIC TREATMENT——Cross-linkable, oxygen-containing polyamides plus noncrosslinking polyethers G,1

U S Pat 2,820,724 (Du Pont——Sneed——Jan 21, 1958)

Antistatic agents which are not fast to washing or drycleaning are useless to the consumer. Therefore, many of these antistatic processes described in prior literature are based on the application of washfast resins that are insoluble in commercial cleaning liquids. Quite generally, these resins, which are effective in high concentrations only, impart harsh boardiness to the treated textiles.

According to the current patent, a composition which renders the material durably antistatic without impairing the natural hand of the goods consists of three components:

a) an aqueous dispersion of a cross-linkable, oxygen-containing *polyamide;*
b) a cross-linking catalyst; and
c) a water-dispersible polyether having no cross-linking properties.

At least 4% of the composition of the polyamides in "a" may be oxygen atoms. They may be in the form of hetero-atoms in the hydrocarbon chain of the original diamine . . $NH_2(CH_2)_3$-O-$(CH_2)_4$-NH_2 or of similar diamides or they may be prepared from diacids and these diamines substituted laterally by OH-groups, eg, 1-3-diamino-2-propanol. Furthermore, they must carry a cross-linking group, the methoxymethyl group being preferred. These polyamides, which are constitutionally akin to nylon, must be dispersible in (dilute) alcohols and need not be of such high molecular weight as to be fiber-forming. The function of the O-content of the polyamide is, principally, to render the composition antistatic, while the *durability* of the effect is correlated with the extent of *cross-linking* property (col 6, line 75 to col 7, line 6).

The cross-linking catalysts ("b") are acids of "intermediate strength", ie, as strong as trimethylacetic acid but not stronger than p-toluene sulfonic acid.

The polyether ("c") should be readily removable by scouring. Examples here are the known condensates of ethylene oxide with alkylphenols or hydroxyesters.

The ratio of "a" to "c" is between the limits of 1:10 and 10:1. The catalyst must be present in amounts of 5-15% of the total solids content.

Example: A typical composition consists of an N-methoxy-methylol derivative of a polyamide dissolved in 10% aqueous propanol ("a") to which is added some crystalline citric acid ("b") and a polyether, which is prepared by polymerization first with propylene oxide and then with ethylene oxide ("c"). Specimen fabrics of Dacron, Orlon or nylon that are padded in this solution and then dried (300°F) and cured (350°F) have an unacceptable boardy hand, but after being scoured with a long-chain alcohol sulfate, such as Duponol ME, the softness is restored. In contrast, fabrics padded in compositions in which the polyether ("c") is omitted cannot be softened further by scouring. Results of electrostatic-potential measurements carried out on all three types of fabrics after treatment with different O-containing polyamides are tabulated in col 5-6, lines 26-48.

Among the references cited by the Patent Office:

U S Pat 2,393,863 (Bakelite Corp/1946): a high-molecular polyethylene glycol may be used as an antistatic agent for vinyl polymers.

U S Pat 2,593,207 (Betex Sales Corp/1952) covers a washfast finish which is obtained by the application of alkoxymethyl polyamide resins. It is designed especially for embossing [cf *Am Dyestuff Reptr* 41, 626 (1952)].

U S Pat 2,714,097 (Du Pont/1955): aqueous dispersions prepared from N-alkoxymethylpolyamides (U S Pat 2,467,186) and mixed with latent catalysts, eg, ammonium citrate, are used to impart various properties, such as antistatic effects, to textiles.

DURABLE MECHANICAL FINISHING EFFECTS ON RAYON ——Highly alkylated methylolureas applied G,4

U S Pat 2,820,715 (British Ind Plastics——Brookes, Smith O——Jan 21, 1958)

This patent covers a process by which textiles may be durably embossed and "washfast-calendered". The fabrics are impregnated with hardenable thermosetting resins, dried to a low moisture content, calender-finished (eg, embossed), and cured analogous to methods known from prior literature (references are cited in col 1, lines 40-42).

Recently, the tendency to apply melamine-formaldehyde compositions, eg, methylated methylolmelamines, in finishes of this type has prevailed. The preamble explains that outstanding effects obtained in this way *on cotton cloth* cannot be realized *on rayon or other regenerated cellulose products,* where the hand of the material is liable to be adversely affected. Presumably, in the latter event the synthetic resin ingredients are too active at too early a stage of impregnation, which also results in poor washfastness (cf col 2, line 56 to col 3, line 18).

This problem reportedly has been solved by using, as an impregnating agent for rayon, an aqueous solution of a water-soluble, lower-alkylated dimethylolurea having a minimum etherification of 75% combined with an acid-curing or potentially acid-curing catalyst. According to 12 examples, the percentage of methoxy groups has been determined by the standard Zeisel method as 80-87% of the theoretically possible full degree of methylation.

It is a characteristic of alkylated aminoplasts *in general* that the products must be hydrolyzed or de-etherified before resinification of the methylol compound is begun. This is the reason for the greater stability of the etherified compounds, even in the presence of curing agents.

Example: A viscose-rayon-staple fabric was impregnated with an 8.5% solution of dimethylether of dimethylolurea plus 0.17% ammonium thiocyanate. The fabric was squeezed to a wet pick-up of 118%, dried in circulating air of maximum 80°C to a moisture content of 10%, embossed between rollers (temperature 130°C), and cured for 10 minutes at 140°C. The hand was found to be excellent and the embossed effect reportedly resisted washing for 10 minutes in a 0.5% soap solution at 95°C.

Among the references cited by the Patent Office:

U S Pat, 2,121,005 (Raduner/1938): a durable calender finish is obtained by impregnating with an aqueous solution of a thermosetting resin, drying to slightly moist condition, treating on a calender, and curing.

U S Pat 2,142,623 (Calico Printers' Assoc/1939): durable calender effects are produced by impregnating fabrics with neutral urea-formaldehyde precondensates, forming on a calender, and treating with acidified salt solutions, such as the chlorides of Ca, Mg or Al.

U S Pat 2,617,744 (Am Cyanamid/1952) covers the treatment of nonwoven fabrics with neutral colloidal solutions of cationic-polymerized urea-formaldehyde resins, drying, and curing at about 140°C [cf *Am Dyestuff Reptr* 42, 394 (1953)].

INDEX TO PATENT DIGEST

Following is an index, by subject and patent number, of the patent abstracts that have appeared in the Patent Digest during 1958.

SUBJECT INDEX

ACID DYEING OF WOOL WITH CERTAIN METAL COMPLEX AZODYES——Ethylene Oxide Condensates as Assistants (Brit Pat 784,664) ... 594

ANTISTATIC AND REWETTING AGENTS——Combination of Hydroxyamines and Polyhydric Alcohols (U S Pat 2,809,159) ... 529

ANTISTATIC TREATMENT OF SYNTHETIC FIBERS by Applying Pentahalo-Benzene-Sulfonates (U S Pat 2,815,301) ... 814

ANTISTATIC TREATMENT——Lanolin Deposited on the Fibers from Emulsions (Brit Pat 767,771) ... 313

ANTISTATIC TREATMENT——Polymeric Quaternary Ammonium Compounds (U S Pat 2,808,349) ... 593

APPARATUS FOR CONTINUOUS DYEING AND FINISHING PILE FABRICS (U S Pat 2,785,042) ... 201

BLEACHING COTTON GOODS——Solvent Treatment Followed by Desizing and Bleaching (U S Pat 2,790,699) ... 60

CARPET DECORATING DEVICE——Color Soaked up on Defined Areas (U S Pat 2,816,811) ... 814

CREASE AND SHRINKPROOFING EFFECTS——Condensates of Pentaerythritol Dialdehydes (U S Pat 2,765,996) ... 60

CREASEPROOFING TEXTILES——Soft Hand on Starch-Sized Fabrics (U S Pat 2,808,341) ... 593

DURABLE CALENDER EFFECTS——Nonvolatile Acetals Applied (U S Pat 2,785,947) ... 23

DYEABILITY OF TEREPHTHALATE FIBERS INCREASED by Admixture of Isophthalate Esters to the Dope (Brit Pat 769,405) ... 23

DYEING GLASS FIBERS——Impregnating with Color-Pigmented Alkylalkoxy Silanes (U S Pat 2,778,746) ... 132

DYEING NYLON WITH METALLIZABLE AZODYES in Presence of Copper Salts and Complex-Forming Acids (Brit Pat 765,080) ... 22

DYEING OF ACRYLONITRILE FIBERS——Condensate of Furfuryl Derivative and Phenol as Assistant (U S Pat 2,812,230) ... 754

DYEING OF POLYACRYLIC FIBERS——Cupric Salts and Naphthols Combined (U S Pat 2,812,998) ... 530

DYEING OF POLYACRYLIC-CELLULOSE ESTER FIBER BLENDS——N-compounds Added to Cuprous Ion Dyebaths (Brit Pat 784,191) ... 593

DYEING OF POLYACRYLIC FIBERS——Reaction Products of Cupric Salts and Phenyl-phenols Used (U S Pat 2,796,318) ... 423

DYEING POLYACRYLONITRILIC MATERIALS——Pretreatment with Hydroxylamine Solutions (U S Pat 2,792,276) ... 62

DYEING POLYESTER FIBERS with Hydroxyanthraquinones (Brit Pat 779,803) ... 423

DYEING WITH PRECIPITATED METAL OXIDES——Heat Aftertreatment (Brit Pat 778,415) ... 314

EMBOSSED CALENDAR EFFECTS——Shrinking Resin Preprinted-Fabrics (U S Pat 2,766,868) ... 131

EMBOSSED PIGMENT PRINTING EFFECTS——Paste Containing Metal Driers Applied (Brit Pat 784,336) ... 594

EMBOSSING AND COLORING FABRICS——Mixtures of Thermosetting and Thermoplastic Resins Used (U S Pat 2,802,752) ... 424

EMULSION FOR PIGMENT PRINTING——Protective Colloids Reacted with Polyfunctional Compounds (U S Pat 2,813,083) ... 813

EMULSIONS FOR WATERPROOFING——Also for Mothproofing Treatments (U S Pat 2,804,391) ... 529

FLAME- AND WATERPROOF FINISH——Metal Salts plus Hexamethylene Tetramine Exposed to Ultra Red Radiation (U S Pat 2,780,566) ... 131

FLAMEPROOF TEXTILES——Halonitrides of Phosphorus Reacted with Ammonia (U S Pat 2,782,133) ... 423

FLAMEPROOFING ——— Haloalkyl - Alkenyl - Phosphonates (U S Pat 2,803,562) ... 423

FLAMEPROOFING OF TEXTILES——Phosphorus-Containing Amino Resins (U S Pat 2,809,941) ... 608

FLAMEPROOFING OF TEXTILES——Treatment with Polymers of Dialkenyl-Monochloromethane-Phosphonates (U S Pat 2,811,469) ... 614

FLAME-RESISTANT WASHFAST EFFECTS——Guanylmelamine Pyrophosphates Applied (U S Pat 2,779,691) ... 131

GAS-FADING INHIBITORS——Esters of Hydroxy-Alkylamines (U S Pat 2,813,774) ... 814

GAS-FADING INHIBITORS——Cyanoalkylated Amines of Heterocyclic N-Compounds (U S Pat 2,815,773) ... 813

HIGH-TEMPERATURE VAT DYEING——Magnesium Ions Introduced in Hydrosulfite Bath (U S Pat 2,803,516) ... 424

HYDROPHOBING OF TEXTILES——Aluminum Alcoholates Reacted with Monobasic Acids and Waxes (U S Pat 2,801,190) ... 470

HYDROPHOBING OF TEXTILES——Methylolmelamine Impregnation Followed by Organo-Silicone Treatment (U S Pat 2,802,754) ... 470

HYDROPHOBING OF TEXTILES——Organosilicones Plus Zirconium Compounds (U S Pat 2,789,956) ... 61

ICE-COLOR PASTES CONTAINING DIAZO AMINO COMPOUNDS——Neutral Steam Development (Brit Pat 778,928) ... 314

IMPROVING FASTNESS OF DIRECT DYEINGS——Quaternized Polyamines plus Water-soluble Sulfates (Brit Pat 761,668) ... 23

PERMANENT FINISHES——Cellulose Esterified or Etherified with Unsaturated Chains in Two Steps (U S Pat 2,789,030) ... 202

PIGMENT DYEING OR PRINTING——Dyes Fixed by Regenerated Viscose Solutions (Brit Pat 776,796) ... 313

PLISSÉ EFFECTS by Applying Hydroxymethylated Imidazolidone and Printing with Shrinking Agents (U S Pat 2,810,624) ... 614

POLYESTER FABRICS DYED WITH METALLIZABLE AZO DYES——Metal Coordination Compounds Applied (Brit Pat 777,377) ... 314

RESIN-FINISHED CELLULOSIC FABRICS——Loss on Tensile Strength by Chlorine Treatment Avoided (U S Pat 2,804,402) ... 529

SHRINK- AND CREASEPROOF TEXTILES——Mixtures of Polyepoxides and Polymethylol-Substituted Nitrogen Compounds (U S Pat 2,794,754) ... 201

SHRINKPROOFING REGENERATED CELLULOSE——Alkoxymethylene Quaternary Compounds Applied (U S Pat 2,793,929) ... 202

SOLVENT SOLUTIONS OF METALLIC SOAPS——Gluconic Acid as Viscosity Reducing Agent (U S Pat 2,785,989) ... 60

STABILIZING CELLULOSIC FABRICS——Acetals Applied (U S Pat 2,785,948–49) ... 23

STABILIZING REGENERATED CELLULOSIC TEXTILES by Reacting with a Higher Ketene Dimer (U S Pat 2,791,484) ... 61

VAT DYEING AND PRINTING——Metal Powders for Developing Hydrogen in Reduction (Brit Pat 775,820) ... 314

WATER-REPELLENT FABRIC——Dispersions of Oxydimethylene-Bis-Acylamides (U S Pat 2,793,142) ... 61

WRINKLE-RESISTANT FABRICS——Reaction Product of Acetylene Diurea with Formaldehyde (U S Pat 2,803,564) ... 425

PATENT INDEX

U S Pat 2,766,868 (Sayles Finishing Plant) ... 131

U S Pat 2,778,746 (A H Kerr & Co) ... 132

U S Pat 2,779,691 (Am Cyanamid) ... 131

U S Pat 2,780,566 (de Luxembourg) ... 131

U S Pat 2,782,133 (CFMC) ... 423

U S Pat 2,785,042 (Collins & Aikman) ... 201

U S Pat 2,785,947 (Quaker Chem Prod) ... 23

U S Pat 2,785,948–49 (Quaker Chem Prod) ... 23

U S Pat 2,785,989 (Am Cyanamid) ... 60

U S Pat 2,785,996 (Quaker Chem Prod) ... 60

U S Pat 2,789,030 (Cluett Peabody) ... 202

U S Pat 2,790,699 (Imp Chem Ind) ... 60

U S Pat 2,789,956 (Wacker Chemie GmbH) ... 61

U S Pat 2,791,484 (Am Viscose) ... 61

U S Pat 2,792,276 (Pacific Mills) ... 62

U S Pat 2,793,142 (Du Pont) ... 61

U S Pat 2,793,929 (Onyx Oil & Chem) ... 202

U S Pat 2,794,754 (Shell Development) ... 201

U S Pat 2,796,318 (Deering Milliken) ... 423

U S Pat 2,801,190 (Farbwerke Hoechst) ... 470

U S Pat 2,802,752 (Apponaug) ... 424

U S Pat 2,802,754 (General Electric) ... 470

U S Pat 2,803,516 (Am Cyanamid) ... 424

U S Pat 2,803,562 (Dow Chemical) ... 423

U S Pat 2,803,564 (Dan River Mills) ... 425

U S Pat 2,804,402 (Monsanto Chem) ... 529

U S Pat 2,808,341 (Dan River Mills) ... 593

U S Pat 2,808,349 (Rohm & Haas) ... 593

U S Pat 2,809,159 (Dexter Chem) ... 529

U S Pat 2,809,941 (Secy Agric) ... 608

U S Pat 2,810,624 (Rohm & Haas) ... 614

U S Pat 2,811,469 (Victor Chem Wks) ... 614

U S Pat 2,812,230 (Deering Milliken) ... 754

U S Pat 2,812,998 (Deering Milliken) ... 530

U S Pat 2,813,083 (Craemer) ... 813

U S Pat 2,813,773 (Bad Anilin- & Sodafabr) ... 813

U S Pat 2,815,301 (Dow Chemical) ... 814

U S Pat 2,816,811 (Deep Dye Ind) ... 814

Brit Pat 761,668 (Farbenfabr Bayer) ... 23

Brit Pat 765,080 (Sandoz Ltd) ... 22

Brit Pat 767,771 (Lanolized Inc) ... 313

Brit Pat 769,405 (Imp Chem Ind) ... 23

Brit Pat 775,820 (Steimle) ... 314

Brit Pat 776,721 (Bad Anilin-& Sodafabr) ... 313

Brit Pat 776,796 (Sandoz Ltd) ... 313

Brit Pat 777,377 (Imp Chem Ind) ... 314

Brit Pat 778,415 (Crossland & Pickstone) ... 314

Brit Pat 778,928 (Farbenfabr Bayer) ... 314

Brit Pat 779,803 (Farbenfabr Bayer) ... 423

Brit Pat 784,191 (Soc Rhodiaceta) ... 593

Brit Pat 784,336 (Ciba Ltd) ... 594

Brit Pat 784,664 (Farbenfabr Bayer) ... 594

News of the Trade

Uniform System of Certification in W&W Testing Held Essential

Consumer confidence and satisfaction with "wash-and-wear" can be improved by a simple effort on the part of the processors and manufacturers to test, classify and accurately label their products, George Fine, president of the American Wash and Wear Institute told millmen, textile executives, manufacturers and finishers at a recent organizational luncheon at AWWI headquarters, 101 West 31st St, New York, NY.

"The public is confused with wash and wear in relation to what it can actually do because of the many standards of testing and the innumerable and varied washing and drying instructions," Mr Fine maintained.

That the job of consumer education can effectively be accomplished only after all phases of the textile industry recognize the necessity of working together through a central quality control agency was stressed by Mr Fine.

A certification system that has been introduced by the Institute was outlined:

A tag showing a green seal to indicate "Little or No Ironing Required."

A tag showing a yellow seal to indicate "Minimum Ironing Required."

The American Wash and Wear Institute believes, Mr Fine said, that at the present time a "No Ironing Required" classification is impractical and that it is unwise to unconditionally certify for such performance because of the many variables involved in manufacturing "wash-and-wear" as well as conditions of home laundering.

Three basic qualification tests for "wash-and-wear" were mentioned, covering, namely:

1) Fabric wash-and-wear appearance and shrinkage

2) Garment wash-and-wear appearance

3) Chlorine damage.

It was suggested that labelling instructions should be specific about fiber content as washing temperatures vary. It was also suggested that products should be evaluated after five washings for degree of wrinkling, seam puckering and pressed-in crease retention. In the case of AWWI, individual sets of photographic standards are used to rate each of these properties. Each photograph in each set of standards is assigned a rating of 1 through 5.

Judging of the test specimens should be done by trained observers in a room with highly developed lighting conditions, AWWI believes.

A rating of 3.0 to 3.9 is required for AWWI's yellow seal; while a rating of 4.0 or better will rate the green seal.

At the present time, about three major testing agencies, each with a different system of certification, are available to the manufacturer for analyzing the wash-and-wear qualities of his product.

USDA Home Economics Group Advises Research to Improve Textile Durability Tests

Stress on research to improve the testing of clothing and textiles for serviceability and performance was advocated by the U S Department of Agriculture's Home Economics Research Advisory Committee at its annual meeting in Washington, Dec 8-10.

Improved laboratory testing methods, correlated more closely with actual wear and care data, would enable manufacturers and consumers to predict the actual performance of textile fabrics, it was stated.

In the field of textile and clothing research, the Committee gave high priority to research that would determine the durability of new finishes that impart wrinkle resistance, water repellency, and other qualities to fabrics. Specifically, the committee felt a need for the research development of chemical and physical tests to predict how well the new finishes will last under repeated home and commercial launderings and drycleaning.

Hydrogen Peroxide Output Increased by FMC Affiliate

The International Division of Food Machinery and Chemical Corp has announced the completion of an expansion in hydrogen peroxide capacity by its Mexican affiliate, Electro Quimica Mexicana, S A, with whom FMC recently became associated. This current increase brings the plant capacity to 4,500,000 pounds per year of hydrogen peroxide, an eight-fold increase since the beginning of the expansion.

Hold New Type Corn Has Extraordinary Possibilities

Development in research quantities of a new type of corn with extraordinary possibilities in the production of new types of starches with application in many industries, including textiles, was announced last month by National Starch Products Inc, and American Maize-Products Co, coventurers in the project.

The project has been going on since 1953 under the auspices of Bear Hybrid Corn Co, Decatur, Ill, and the U S Dept of Agriculture's Northern Research Laboratory, Peoria, Ill.

President Theodore Sander, Jr, and Research Director James W Evans of American Maize, and Chairman Frank K Greenwall and Vice President—Research C G Caldwell of National Starch, said that preliminary research estimates of application of starch manufactured from the new corn, known as amylomaize, indicate several possibilities in the near future. One such possibility is its use as a packaging material for water-dispersible products such as dyes, detergents, insecticides and industrial chemicals as replacement for the more expensive water-soluble synthetic films now used.

Other possibilities include use as a permanent finish for fabrics and use in low-cost fabrics made from a combination of cotton and corn starch.

The company executives said that the economic appraisals by their research teams of immediate and future potentialities are suggested by the similarity of the new amylose and cellulose. Currently, they said, the amylose content of starch from the newly developed corn is 55 percent and the starches show superior performance to previous starches in all uses where film formation is required, including textile sizes.

As the amylose content of the starch approaches 100 percent as a result of the genetic research activities now underway, it was indicated, product applications will be expanded.

The substantial acreage of the new corn grown this year and just recently harvested will make possible the first trial milling run in commercial equipment. This is expected to provide semicommercial quantities of high amylose starch for the application studies in National Starch Products' research laboratories at Plainfield, NJ and American Maize's laboratories at Roby, Ind.

Increased Production, New Prices for Polyox Resins

Union Carbide Chemicals Company, division of Union Carbide Corporation, has announced the completion of the first commercial unit for the production of its Polyox water-soluble resins. The new unit, at the Company's South Charleston, W Va, plant, has a reportedly capacity of more than a million pounds per year.

Polyox resins, introduced late in 1957, have been available in development quantities from pilot-plant facilities.

Now, three commercial grades of Polyox resins, designated WSR-35, WSR-205, and WSR-301 are available in truckload quantities. The new price schedule is 85 cents per pound in 20,000-pound lots, 95 cents per pound in 150 to 20,000-pound lots, and $1.05 per pound in less than 150-pound lots. All prices are fob South Charleston.

Plans for further expansion are being evaluated and a larger commercial unit will be constructed in time to anticipate market growth.

In textiles, Polyox resins are being widely evaluated in mill-scale trials as warp sizes for synthetic yarns, synthetic-cotton blends, cotton, and worsteds.

28th Annual Meeting, ISCC

"The Use of Material Standards for Color Matching" will be the general title of an afternoon symposium to be held as part of the Inter-Society Color Council's 28th Annual Meeting, which is scheduled for Wednesday, April 1 at the Statler Hilton Hotel, New York, NY.

Moderator for the symposium will be W J Kiernan, program chairman for the Annual Meeting. Speakers and subjects will include:

A J Benjamin, Monsanto Chemical Co, "Material Color Standards; Practical Problems and Acceptance."

Harry J Keegan, National Bureau of Standards, "Material Color Standards; the Instrumental Approach."

Hugh Davidson and Henry Hemmendinger, Davidson and Hemmendinger, "Material Color Standards; the Visual Approach."

The annual business meeting will be held Wednesday morning.

At the banquet on Wednesday evening, the guest speaker will be Deane B Judd, National Bureau of Standards, who will speak on his personal experiences in the field of color and material color standards.

Advance registration blanks may be obtained by writing to Ralph M Evans, ISCC secretary, Color Technology Div, Bldg 65, Eastman Kodak Co, Rochester 4, NY.

W Lyle Holmes Jr, Archibald Holmes & Sons, chairman of the board of Philadelphia Textile Institute; Ralph Whitaker Co, chairman of the PTI Building Committee; and Everett L Kent, Kent Mfg Co, president of the PTI Foundation, took part in recent ground-breaking ceremonies of the $650,000 student union building of the Philadelphia Textile Institute.

Erection of the building was made possible as a result of a successful $200,000 fund-raising campaign conducted by the PTI Foundation in 1957 and a $450,000 loan from the Federal College Housing Program of the Housing and Home Finance Agency.

The new building will provide auditorium and gymnasium facilities, a cafeteria, and eight student activity rooms. The building will be called Althouse Hall in honor of C Scott Althouse, chairman of the board, Althouse Chemical Co, Reading, Pa, a 1900 graduate of the Institute.

HRL Moves Labs

Harris Research Laboratories, Inc, which serves the fiber, textile and allied chemical industries, has announced the removal of its research laboratories to new and expanded quarters at 6220 Kansas Ave, NE, Washington 11, DC. The new phone is TU 2-4043.

QM R & E Command Seeks Scientific Director

The Army Quartermaster Research & Engineering Command, Natick, Mass is seeking candidates to fill the scientific director post at the Command.

Starting at approximately $16,500, this permanent civil service post calls for directing an annual $25,000,000 R & D program devoted to improving the combat soldier's clothing, food, and equipment.

Degrees and top-level experience in physical sciences or engineering are required.

Inquiries or Federal Employment Application form 57 are invited before January 31st. Address Henry R Rose, civilian personnel officer, Headquarters, Quartermaster Research and Engineering Ctr, Natick, Mass.

CATCC Symposia on Textile Technology

"Theories and Principles of Dyeing" will again be the theme of the new series of symposia to be presented for the first four months of 1959 under the auspices of the Quebec Section, Canadian Association of Textile Colourists and Chemists.

First of the series will be presented Friday, Jan 23 at the Ciba Company's Conference Room, 1235 McGill College Ave, Montreal at 7:30 pm, at which time J J Leavitt, manager, dyes research, American Cyanamid Co, Bound Brook, N J, will discuss "Theories and Principles of Dyeing Cationic Colors".

The remainder of the schedule is as follows:

Friday, Feb 20—"Theories and Principles of Dyeing Reactive Colors", Raymond Thornton, technical service mgr, Arnold, Hoffman & Co, Inc.

Friday, March 20—"Theories and Principles of Dyeing Vat Colors", D I Randall, product line mgr, vat dyes, General Aniline & Film Corp.

Friday, April 10—"Theories and Principles of Dyeing Premetallized Colors", W Kass, technical mgr, Verona Pharma Chemical Corp.

Registration for the four events is $10.00; for a single meeting, $5.00. For further information, contact Carl R Teichgraber, c/o Domil Ltd, 4790 St Ambrose St, Montreal 30, Que.

Elvacet Price Reduction

A price reduction of two cents a pound—or about 11 percent—on all grades of Elvacet polyvinyl acetate emulsion was announced last month by the Du Pont Company.

New tank car prices are 16 cents a pound for homopolymer grades and 18 cents for the copolymer type. A series of reductions since World War II have slashed polyvinyl acetate prices by more than one-third from the 25-cent per pound level of 1945.

14th Purdue Industrial Waste Conference

Approximately fifty papers will be presented on subjects dealing with industrial wastes and their treatment at the 14th Purdue Industrial Waste Conference, which will be held May 5-7 in the Purdue Memorial Union Bldg, Purdue Univ, Lafayette, Ind.

Registration blanks and other information may be obtained by writing to Don E Bloodgood, professor of sanitary engineering, School of Civil Engineering, Purdue Univ, Lafayette, Ind.

Sidney M Edelstein, president of Dexter Chemical Corp and chairman of AATCC's Archives Committee, last month presented an original manuscript by Sir Isaac Newton to his alma mater, Massachusetts Institute of Technology.

The manuscript is a 61-page, 55,000-word English commentary and translation of a book on alchemy by Nicholas Flamel, 14th Century Frenchman, who claimed to have succeeded in doing what alchemists tried to do for hundreds of years—to make gold and silver out of cheaper metals (mercury in this case). It will be used in studies of the history of science and technology.

Shown in photo, l to r, are Azel W Mack, vice president, Dexter Chemical Corp; Dr Edelstein; John E Burchard, dean of the MIT School of Humanities and Social Sciences; William M Locke, director of the MIT Libraries; and Giorgio D deSantillana, professor of humanities.

Ahco Relocates Northern Sales Office

The Northern Sales Office of Arnold, Hoffman and Company, Inc has been relocated at the company's home office building, 55 Canal Street, Providence, RI.

Arthur C Merrill, long experienced in other departments of Arnold, Hoffman, has assumed the post of office manager for the Northern sales operation. All orders, correspondence, inquiries and other matters pertaining to Northern sales should be directed to the Providence address, Arnold, Hoffman states, and New England customers should use the Providence telephone service at GAspee 1-2935. A private Paterson, NJ, telephone connection—ARmory 8-1223—will be available to customers outside the New England area.

For the convenience of customers heretofore serviced from Arnold, Hoffman's New Jersey warehouse, Ahco will maintain warehouse stocks at Desmond's Warehouse, 824 Twenty-first Avenue, Paterson, NJ.

Ontario Section, CATCC Meetings

The first meeting of the 1959 season of the Ontario Section, Canadian Association of Textile Colourists and Chemists, will be held this Friday, January 16th, at McMaster Univ, Hamilton, Ont. H Lomas, Canadian Aniline and Extract Co, Ltd, will speak on the subject "Ionics."

The Section will hold its 24th Annual Meeting and Banquet at the Royal Connaught Hotel, Hamilton, on Saturday, February 7. The business meeting will begin at 3 pm, and be followed by a general reception at 5:45 and the annual dinner and entertainment at 6:45. The traditional "buffet supper" will begin at 11:30 pm.

Course in Fiber Technology

As a guest lecturer, J J Press, chief, Textile Research Branch, U S Navy Clothing and Textile Research Laboratory, will present a course on "The Technology of Natural and Synthetic Fibers" during the spring semester at the Polytechnic Institute of Brooklyn.

Covering the full scope of the engineering of man-made textile structures, the course, #1844, will meet for a two-hour period once a week on Tuesday evenings from 6-8 pm. Registration will be from January 26-29.

The graduate level course is designed to fill a gap which is thought to exist between the chemical and textile industries. It is open to those who hold degrees in chemistry or chemical engineering or who have had equivalent experience in textile fields.

Mr Press also is editor-in-chief of the forthcoming "Man-Made Textile Encyclopedia."

NTTCIW Reviews Work of Task Groups

The National Technical Task Committee for Industrial Wastes held its ninth annual meeting December 11-12 at Cincinnati with 52 scientists and engineers representing most of the nation's major industries in attendance.

The Task Committee, chairmanned by Richard D Hoak, senior fellow of the Mellon Institute, Pittsburgh, continued to direct its attention both to immediate and long-range planning concerning problems related to industrial wastes. The Committee was created in 1950 by the Surgeon General of the U S Public Health Service. It serves as an industry forum on waste problems and as an advisory group to PHS.

On Thursday, at the technical session held at the PHS Robert A Taft Sanitary Engineering Center, the Committee heard reports of the four major Task Groups: Food Industries, Mineral Products, Chemical Processing, and General Industry.

Part of the summary by the Chemical Processing task group follows:

"In the textile industry the year 1958 saw increased research in textile waste treatment, and widespread interest in a practical and economical approach to the problem.

"The Industrial Waste Guide to the Cotton Textile Industry, prepared by the National AATCC and Piedmont Section Stream Sanitation Committees in cooperation with the NTTCIW, is in the final stages of revision and printing.

"Data from other research have indicated that excellent results in treating textile wastes can be obtained at a low initial cost by treating in aerated lagoons, with reduction in BOD up to 90% and better. Experiments at Cone Mills using modified activated sludge (Biosorption type) for treatment of textile wastes and domestic sewage also have been highly satisfactory. A new type of activated sludge waste treatment system, which is called a complete mixing activated sludge system, has been used to treat industrial wastes from a cotton finishing plant. This treatment plant is almost completely automatic.

"Additional studies have been made in treatment of alkaline sulfur dye waste with flue gas, and in reducing textile waste problems by using starch substitutes. In-plant methods of reducing textile wastes and toxicity effect of chrome, cyanide and ferrocyanide compounds on activated sludge have been studied in addition to treatment methods (*Sewage and Industrial Wastes*, p 992-1011, August 1958)."

Colloidal Factors in Textile Pigment Printing Emulsions

(*concluded from page 4*)

Positive adsorption at the interface is the explanation given by this theory for the reduction of interfacial tension and formation of the interfacial film, and it shows why O/W or W/O emulsions are formed as a consequence of the difference in surface tension of the two sides of the interfacial film. The theory does not explain the structure of the interfacial film, the phenomena of emulsion breaking and phase reversal, and reveals little about the role of the emulsifier.

The Hydration Theory. This assumes that substances are capable of acting as emulsifying agents only because they bind the dispersion medium with the formation of colloidal hydrates in water, or solvates in other dispersion media. Hence an O/W emulsion will be produced if a colloidal hydrate is formed with the water phase, and an opposite or W/O emulsion is formed if a solvate is formed in the oil phase. This theory is inadequate in that there are many surfactants which do not form hydrated complexes to a sufficient extent. Further, it gives no explanation of how equilibrium within the emulsion is balanced. However, it does explain the avoidance of emulsion breaking by tying up the reactive water in hydrated complexes.

The Oriented Adsorption Theory. This is similar to the adsorption theory but adds molecular orientation positions to the adsorbed substance at the interface. This addition explains the role of the emulsifying agent which acts to make the transition between phases less abrupt. This theory accepts the idea of small, finely divided solids with wettability by both phases, and hydration and solvation complex formation. It does not explain why and under what conditions either the O/W or W/O type emulsions form, and the phenomena of phase reversal.

The Oriented Wedge Theory. This is a special theory for soaps, which asserts that, due to the metallic element at the polar end of the hydrocarbon acid, or due to metal valence attaching to acid radicals, the soap molecules are in the form of wedges, which cause the interface to curve. In the case of an alkali soap, which has a bulkier head than tail, it would be expected to emulsify oil, and similarly a bulkier tail would emulsify water. This theory does not explain the properties of Silver soaps, which form the opposite type of emulsion even though its valence and atomic volume is larger than the alkali metals, and no explanation is given for cation and nonionic emulsifiers, which promote both types of emulsions.

The Electrokinetic Theory. This points out that electric charges occur in emulsions around the droplets. How the charges are formed and how important they are, are widely debated. It is usually thought that the charges are derived by adsorption of electrically charged ions at the surface of the particle either by electrolytic dissociation of molecules at the surface or by capture of ions from the aqueous phase. The globules with like charges would tend to repel each other and to increase emulsion stability. Since most of the globules are not of small enough size for stabilization by these charges alone, they must have the help of emulsifying agent, especially in emulsions of large particle size and high volume of internal phase. The formation of an electrokinetic potential due to ionic double layer formation also has been given as a reason for emulsion stability. The electric charge theory, as developed, was based on very fine oil hydrosol emulsions at high dilution and the conclusions drawn are probably not valid for concentrated emulsions having a large particle size. A general theory based solely upon electrical charges has little chance for acceptance although it is easily integrated into a generalized theory such as that of Roberts (*14*).

CONCLUSION

It can be observed that textile pigment printing emulsions must be balanced in pigment dispersion, solvency, colloidal and emulsion factors, and have the proper viscosity for printing and handling ease. They must also be formulated to give the lowest raw material and production costs at the best color strength, fastness, and package stability consistent with customer demand. These requirements present a formidable, continuous, and interesting challenge for the formulator.

ACKNOWLEDGMENT

The author gratefully acknowledges the assistance of F W May, general manager, J Pisetzner, sales service manager, Ansbacher-Siegle Corp, Justus Hoyt, product manager, and David Mullin, chief chemist, Textile Color Dept of Ansbacher-Siegle Corp for their constructive criticism of the manuscript.

REFERENCES

(*1*) Jones, G F, "Pigments for Textiles," *Am Dyestuff Reptr* **45**, No. 9, P263 (April 23, 1956).
(*2*) "Celite," Johns-Manville technical bulletin.
(*3*) "Physical Chemistry Research in the Protective Coating Industry," *Calco Tech Bull* No. 901.
(*4*) Hoback, "Pigment Dispersion Theory and Practice," *Calco Tech Bull* No. 903.
(*5*) Kruyt and Van Klooster, "Colloids," Wiley & Sons (1929).
(*6*) Green and Haslam, *Ind Eng Chem* **19**, 53 (1927).
(*7*) Forbes, *J Oil Color Chem* **15**, 151 (1932).
(*8*) Shur, *Interchem Rev, 32* (Summer, 1956).
(*9*) Gartner, "Outlines of Biochemistry," 161, Wiley & Sons (1929).
(*10*) Long and Lawton, *Official Digest* No. 31, 1010 (1950).
(*11*) *J Phys Colloid Chem* **51**, 1037 (1947).
(*12*) Bott, *Official Digest* No. 22, 408 (1950).
(*13*) Sutheim, "Theories of Emulsions."
(*14*) Roberts, *J Phys Chem* **36**, 3087 (1922).
(*15*) Carothers, *Chem Reviews* **8**, 3p, pp2 (1944).

EMKAY CHEMICALS FOR YOUR TEXTILE PROCESSING
EMKAY MANUFACTURES:
• Emkabase • Emkalube • Emkasize • Rexobase • Re
• Emkacide • Emkanet
• Emkafol
• Emkagen
• Emkalane
• Emkalite
• Emkalon • Emkapon • Emkawate • Rexogum • Rexoscour
• Rexosolve • Rexowax
• Rexoslip • Rexowet
KNIT-GOODS PROCESSORS!
TECHNICAL DATA SHEET #166 ON AUXILIARIES NOW AVAILABLE—WRITE FOR COPY TODAY
• Rexogel • Rexopon
MANUFACTURING CHEMISTS
EMKAY
CHEMICAL COMPANY
EMKA PRODUCTS-REXO
EMKAY CHEMICAL COMPANY
319-25 Second St., Elizabeth, N. J. ELizabeth 2-7053 - 7695

ted emu-
e size. A
ely upon
hance for
easily in-
d theory
14).

xtile pig-
st be bal-
ion, sol-
n factors,
osity for
se. They
give the
roduction
gth, fast-
consistent
hese re-
ible, con-
llenge for

NT

acknowl-
W May,
er, sales
er-Siegle
manager,
ist, Tex-
er-Siegle
criticism

tiles," *Am*
(April 23,

al bulletin.
n the Pro-
Tech Bull

Theory and
903.
ds," Wiley

hem 19, 53

l (1932).
, 1956).
stry," 161,

st No. 31,

47).
(1950).
"
(1922).
pp2 (1944).

R

STS
L
O

12, 1959